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SERMONS IN STONES;

OR,

SCRIPTURE

CONFIRMED BY GEOLOGY.

59560

BY

DOMINICK McCAUSLAND,

THE AUTHOR OF "THE TIMES OF THE GENTILES," &c.

"Teach me, by this stupendous scaffolding,
Creation's golden steps, to climb to thee."

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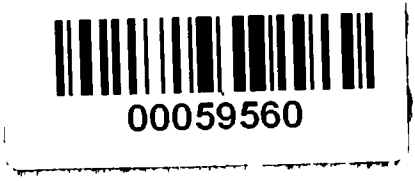

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PREFACE.

Is the Mosaic narrative of the creation reconcileable with the established facts of Geology, or is it a true and authentic record of a series of events which occurred on our planet previous to the existence of the human race? These are questions of vital importance to all who rely on the inspiration of Holy Writ, and profess to have an interest in the precepts and promises which it contains: and yet, it must be admitted, that they have never hitherto been satisfactorily answered. To confirm this statement, it will be sufficient to mention the fact, that the Rev. Baden Powell, the Savilian Professor at Oxford, and an Author of some note, has, in a recent work, entitled "The Unity of Worlds," assumed it to be a fact, not to be ques-

tioned by Religionist or Philosopher, that the discrepancies are not merely irreconcileable, but that there is a "*palpable contradiction*" between the facts of Geology and the Bible record of the Creation. It is seldom that opinions and principles so subversive of the whole structure of revealed truth, are propounded with so little reserve. Nevertheless, they are the opinions and principles of many who have given attention to the subject, and profess at the same time, somewhat inconsistently, to believe in the divine inspiration of Scripture.

It ought not, therefore, to be matter of surprise, that the pursuits and inquiries of the Geologist should have been frequently regarded with distrust and aversion by the Christian believer; and that, on the other hand, many of those who are well versed in the knowledge of Geological facts, should have entertained misgivings as to the accuracy of the Mosaic record. Such feelings could only have originated in a crude and imperfect knowledge of the truths of Science, on the one side,

and in erroneous impressions of the meaning of the Scripture text, on the other: for, if the writer of Genesis has not been deceiving himself and others, and if the philosopher who has been labouring in the compilation of the facts of Geology, has not approached his fellow-man with a lie in his right hand, the Record of the Bible and the Record of the Geologist must harmonize in every particular. However great and discordant their discrepancies may appear, they cannot be insuperable, and the difficulties must admit of a solution; for there can be no inconsistency between the Word and the Works of the Almighty.

To develope this harmony, and to demonstrate the correspondence of the items which are shown by Geology to have composed the vast chain of being, and the order of their appearance on the stage of existence, from the beginning of light and life to the birth of Adam, with the catalogue of the Creation in Genesis—and thereby to establish the divine inspiration of the Bible by evidence that can be seen and handled, is the object of the

following pages. The stony tables of Nature, interpreted and explained by the Geologist, will be found to supply the testimony that the pen of Moses was guided and directed by the hand of the Most High, in tracing the imposing description of the scenes of the pre-Adamite world, which meets us at the threshold "of those things which have been revealed."

In exploring this interesting and instructive field of inquiry, the Author has been careful to enter upon no path which has not been developed and sanctioned by the highest authorities in those departments of physical science which it has been necessary to consult: and the Reader will not find himself called upon to yield assent to any fact which does not admit of sensible or scientific demonstration, or to accept of any reading of the text of Scripture which will not bear the test of the closest critical examination. By such means alone is truth to be detected and perpetuated; for to speculate and theorize on such subjects, is to follow after seductive and treacherous phantoms,

that have seldom failed to involve those who pursue them in pernicious and fatal error.

The Author is sensible that where so many of high talent and deep research have failed to identify the Record of Nature with the Record of Moses, a prejudice must prevail to induce the majority of Readers to distrust *any elucidation* of the subject, and, without considering the consequences, to acquiesce in the hasty and dogmatic assertion of the Author of "The Unity of Worlds," that they are wholly at variance. But it ought to be borne in mind, that the Science of Geology is of recent birth, and unexampled in the rapidity of its growth—so that, as a collection of facts, it must have presented, even within a short period of time, a very different aspect to the student from that which it now presents, when all its members have been defined and arranged, with astonishing accuracy, by the zeal and energy of its professors. Truth has been struggling out of darkness into light; and, with the aid of inductive philosophy, she has gradually emerged from the

mists of theory and conjecture, until her fair proportions stand revealed to the ordinary observer: and thus it is, that the several phases which our planet and its inhabitants have presented at the successive stages of its existence hitherto observed, are now so clearly delineated, that he who has a correct knowledge of the meaning of the Scripture text, can scarcely fail to realize in the teachings of the Geologist, the scenes which have been depicted by the divine historian in the graphic opening episode of the Bible.

Let the Reader go forth, and devote a few of his leisure moments to the inquiry if these things are so, and these pages shall not have been written in vain. Such knowledge is not too high for him; and time and opportunity will not be wanting even to those occupied in the most exacting professional and worldly pursuits,

> "To read creation; read the mighty plan
> In the bare bosom of the Deity."

The Bible is in his hand; and the Book of Nature lies open before him, with the light of Science

shining down upon it. Hill and Vale—Rock and Tree—Ocean and Stream present themselves on all sides, with their contents, as witnesses that the words of Moses are the unimpeachable record of the counsels of old of the Most High, when his fingers were fashioning the foundations of the world. Let him apply his personal observation to the comparison of the description with the things described; and he will thus enlarge the boundaries of his knowledge in a direction which must tend to quicken and consolidate his religious impressions and convictions, and relieve his mind from many of those anxious doubts and fears, which haunt and harass the soul of man, and perplex and sadden the path of his existence.

"The man who consecrates his hours
By vigorous effort, and an honest aim,
At once he draws the sting of life and death—
He walks with Nature, and her paths are peace."

D. M'C.

Dublin, January 1, 1856.

SERMONS IN STONES,

&c.

CHAPTER I.

THE TWO RECORDS OF THE CREATION.

"Read Nature: Nature is the friend of Truth."—*Young.*

In the beginning God made the earth and all that therein is—not by the exercise of a single act of creative power, but by a series of such acts, and according to a certain system or order of progression. It is thus written in the first page of the Bible; and the Record is believed by the great body of Christians merely because it is so written. Some, however, in a sceptical, or, it may be, a more inquiring spirit, seek for a confirmation of the authenticity, authority, and inspiration of the sacred narrative; and if what is there recorded admits of confirmation, the believer in its divine origin cannot resist the demand that there should be some proof given of the Record being consistent with what sense and experience teaches us of the

origin and order of the creation. For upwards of 3000 years after its publication, man was without the means of testing the accuracy of the divine penman: but the progress of observation and science has gradually enlarged the sphere of his knowledge, and furnished him with the means of perusing the early history of our planet, and of ascertaining, with some accuracy, the order of the appearance of the animal and vegetable existences with which it has, from time to time, been furnished. This knowledge has been imparted principally through the medium of the science of Geology, which exhibits to our view what the author of Genesis has described of the pre-Adamite world in the opening scene of the Bible.

Though frequent allusions to geological phenomena are to be found in the writings of philosophers and poets of antiquity, it is only within the last half century that Geology has been admitted into the rank of the sciences, and established as such on the firm basis of legitimate induction. But though it is the youngest born of the physical sciences, yet in the magnitude and sublimity of the objects of its fascinating researches, its practical utility, and the extent and importance of its religious applications, it is second to none. Hence it is, that the study of Geology has attracted and engaged the attention of the most inquiring and

best informed of our philosophers; who, from its collected and classified discoveries, have already compiled an authentic history of the world and its occupants, during the countless ages which have intervened between its creation and the creation of man—a history which rests on surer foundations than the records of any portion or period of the world since the human race came into existence. In this Record, we have presented to our view, the various races of the animal and vegetable creation which have successively occupied the surface of the globe, from the time that the Spirit of God first moved on the face of the deep, until He breathed the breath of life into the nostrils of the first man, and the many changes of condition and vicissitudes which our planet has witnessed throughout the long periods of its preparation for his reception.

It is from the rocks which compose the crust of the earth on which we tread that this information has been derived. In the fossil remains with which they are charged, we behold the very creatures as they existed, in some instances, converted into silex, limestone, or quartz, according to the character of the substance in which they were imbedded, without the slightest alteration in form; in others, we have the lineaments of the animal or plant pourtrayed with the utmost accuracy, and

preserved in the hardened rock. At the bidding of the geologist, the earth gives up the rigid forms of her early-born and long-buried offspring, to testify from their stony sepulchres to her present occupants, of the wisdom and omnipotence of the Creator, at periods when no human mind was in existence to comprehend and appreciate them. From the foot-prints, also, and other traces of the then existing animals, which were impressed upon the soft mud or sand, but now hardened into stone, the forms and dimensions of the creature can be in a great measure ascertained; and, with the assistance of the comparative anatomist, they have been, in many instances, reconstructed—so that, though every particle of the matter of which the frame was once composed has vanished, the creature, as it lived and moved, may still be presented to our wondering view, and enlarge our knowledge of the state and economies of nature at the time of its existence.

These are the principal materials from which geologists have compiled for us the history of this period of our planet's existence. The evidence is derived from the testimony of the senses, and is therefore demonstrative in its nature; and, for the most part, so sure and unerring are the conclusions, that they defy contradiction, and preclude misconstruction.

But, as we have already stated, there is another Record of events which occurred during some portion, at all events, of the same primeval period, traced by the hand of a man, though, as believers maintain, dictated by the Spirit of God. We mean the Mosaic Record of the creation. If it be true that this Record was a revelation from the Almighty, it cannot err; and there can be no inconsistency, much less contradiction, between it and the stony legend of the geologist. Whatever has been written under the divine inspiration, cannot be inconsistent with any thing created by the divine hand. God is truth; and his word cannot be refuted by his works. Nor ought any believer to rest satisfied until the authenticity of the written history shall have been vindicated and established beyond cavil and dispute. The first page of his charter and title to life and immortality must be, not only clear from imputation, but confirmed and corroborated in every particular; and geology, as a collection of well-ascertained facts, must be recognized and welcomed as the heaven-sent test of the truth and inspiration of the Mosaic narrative. There is nothing to be apprehended from that or any other science, when its facts and principles are clearly discerned and settled. "Science has ever been, and ever must be, the safeguard of religion; the

grandeur of its truths may transcend our failing reason, but those who cherish and lean on truths equally grand, but certainly more incomprehensible, ought to see in the marvels of the natural world the best defences and illustrations of the mysteries of their faith [1]."

To reconcile the Bible history of the pre-Adamite world with the facts of geology, by showing that both may be true, and that there is *no contradiction* between them, is a work which has occupied the attention of many excellent and able Christians, and is, no doubt, one which has been of assistance to the cause of truth; but to call in aid those facts to establish and prove the inspiration of the sacred historian, is a work of much higher import and utility in the believer's warfare with the sceptic and infidel. But in no such spirit has geology been yet received. When it first began to assume the form of a science—when its facts were in progress of collection and classification—it was rumoured and insinuated, and afterwards openly asserted and proclaimed by the sceptic, that the Record of Moses was about to be falsified by the evidence of the senses. The inquiries of the geologist were therefore, at first, viewed with suspicion and distrust, and then, with-

[1] *More Worlds than One*, p. 126.

out examination, rejected and denounced by the great body of Christians, who had neither time nor opportunity to ascertain facts, and draw conclusions from them for the satisfaction of their scruples, or the confirmation of their convictions. Nor is it to be denied, but that the writings and speculations of some able geologists afforded grounds for the misapprehensions and prejudices which have prevailed on the subject. Still there were some few men of intelligence and piety, who, firm in their assurance of the divine origin of the Scriptures, hesitated not to grapple with the supposed enemy; and who from time to time endeavoured to convince the world that Scripture could be reconciled with geology—that both might be true; but none of them appear to have gone so far as to summon forth the new-born science as a witness to the truth of the Bible narrative in its simple and obvious meaning, and to set it up as the mainstay and supporter of the Revelation which we hope to prove it to be in the following pages.

Dr. Thomas Chalmers, the celebrated Scotch divine, was the foremost of these champions of Bible inspiration. He was followed by several others of great ability, and well versed in scriptural, philological, and scientific knowledge. The construction which they suggested for the vindi-

cation of Scripture, we shall notice hereafter more particularly. At present, we need only observe, that admitting the certainty of the language of the Bible, and conceding the facts of geology, they contended that the narrative of Moses was not a narrative of the events which occurred from "the beginning," when the heavens and the earth were launched by the hand of the Creator from non-existence into being, down to the creation of man, but only of certain events which occupied the period of the six natural days which preceded the birth of Adam. This mode of treating the subject merely rescued the Scripture narrative from the imputation of falsehood, and supplied nothing in the way of confirmation of its truth and authenticity as a direct communication from God to man.

Besides the foregoing, there are two other classes of religious and philosophic inquirers, who have endeavoured to clear away the difficulties arising from the supposed insuperable discrepancy between the facts of geology and the language of Scripture. Those who compose the one class, admit the facts of geology, but suggest such an imperfection of our knowledge of the Hebrew original in the present day as precludes all certainty of a right interpretation of its meaning[2];

[2] Babbage.

or insist that the narrative is couched in the language of mythic poetry, and was not intended to be an historical detail of natural occurrences [3]. Those who belong to the other class, with more zeal than knowledge, admit the certainty of the meaning of the language of Scripture, but desperately and most unreasonably deny the facts of geology, or crowd them into the narrow compass of time which elapsed between the creation of man and the flood [4]—both of which propositions are demonstrably untrue and impossible.

These well-intentioned but weak advocates of Bible inspiration, in their endeavours to uphold, have betrayed the cause which they espouse, by conceding, either that Scripture is not, what it purports to be, an intelligible narrative of real events, or that it is inconsistent with the demonstrated facts of nature and science. More than this the sceptic need not require for the undermining and loosening of the whole fabric of divine revelation. If Scripture gives an uncertain sound in its first page, where are we to look for a sure word in any part of it; and if, to uphold the Bible, it be necessary to deny facts established by the investigations of the most enlightened and distin-

[3] Baden Powell.

[4] Granville Penn, Fairholme, Kirby, S. Turner, Gisborne, Dean Cockburn, Taylor, &c.

guished of modern philosophers, so accurate and sure as to place them in the rank of sensible and mathematical certainties[5], the triumph of the infidel is complete. An unreasoning denial of well-ascertained facts will justify his equally unreasoning denial of the existence of the God of nature and revelation. It will not be necessary for us to enter into a more detailed consideration of these suggested explanations. They originated in a presumed discrepancy between the written and unwritten record, which we shall prove not to exist; and when this position shall be established, the necessity for such extravagant and dangerous propositions will cease.

How then stands the question between geology and Scripture? Of those who have sought to explain and reconcile the apparent inconsistencies between the Mosaic Record and the facts of the geologist, some admit the certainty of the Scripture language, and the truth of geological phenomena, but avoid the supposed discrepancies between them, by contending that the narrative

[5] The learned and pious Dr. Pye Smith thus speaks of this science,—"Geology, as a science *deduced by the severest logic from phenomena*, which, when once fairly ascertained, a man can no more doubt of (I think I speak not too strongly), than he can doubt it is day when he sees the sun, can scarcely be said to have come into existence till within the last thirty or forty years."—Geology and Scripture, Sup. Notes.

of Moses is not intended to be a narrative of the creation of the animal and vegetable world of the geologist, but of another and a later world. Some again admit the facts of geology, but deny the certainty of the language of the Bible—while others concede the certainty of the Scripture language, but boldly ignore the facts of the geologist. Such a position of the issue between the believer and the sceptic is obviously unsatisfactory, and unfavourable to the cause of religion; which may, in such a state of circumstances, sustain injury, but cannot derive any benefit from the discoveries of this important science.

There is, moreover, in such arguments, a tacit admission of irreconcileable hostility between the written and unwritten Records of the creation, which ought not to exist, if both proceeded from the same source. To take away this reproach from Revelation, and to restore and consolidate the union which must subsist between the Word and the Works of the great Author of all things, is the object of the following pages, in which we shall endeavour to prove, that without, on the one hand, distorting the language of the Sacred Record, or, on the other, ignoring or disturbing one of the well-established inductions of geology, the Record of Moses truly describes what the stony records of nature dis-

close to have been the course and order of the creation—and with such accuracy, that after a full investigation and careful comparison of the facts of geology with the Scripture narrative, we do not hesitate to affirm, that the most accomplished of geologists could not be entrusted to increase or diminish by a single line the sacred Record, without endangering its truth and precision as an epitome of the divine process of framing and furnishing our wondrous world of life and order.

In the execution of our task, we shall, in the first place, as succinctly as is consistent with full information on the subject, sketch the nature and extent of the knowledge of the pre-Adamite world, with which we have been furnished by the researches of the geologist; and then proceed to show that the Record of Moses is a correct description of the successive scenes, of which our planet has been the theatre, since the time that God stretched forth the heavens, and laid the foundations of the earth.

CHAPTER II.

THE GEOLOGICAL RECORD OF THE CREATION.

> "These are thy glorious works, Parent of Good,
> Almighty!"—*Milton.*

THE crust of the earth on which we dwell is a stony mass, covered, for the most part, with water, or alluvial soil. The rocks of which this mass is composed are of different characters and species, and exhibit every variety of texture, from the soft and friable shales and sandstones, to the hardest and most compact marbles, granites, and crystals. These rocks are primarily divisible into two leading and well-defined classes, viz. Stratified and Unstratified.

The Stratified, which are also termed from their origin, Sedimentary and Aqueous rocks, are those which have been formed by deposits at the bottom of water, such as sand, mud, or lime; and which, by pressure and heat, with the aid of some chemical combinations, have become solidified and

converted into stone, as we find them. These are found arranged in layers, and were originally laid down in horizontal, or nearly horizontal positions, on the beds of the primeval oceans, seas, and lakes.

The Unstratified rocks are those which have been formed by the action of fire, and which are, on that account, also termed Igneous. They are not found arranged in layers, but in irregular masses—not having been formed, like the stratified rocks, by horizontal deposits at the bottoms of the waters, but by the protrusion, from time to time, and in different localities, of heated and liquefied masses from below.

It is a well-established fact, that the primitive Granite, an unstratified rock, is the base or floor on which all the other strata have been formed. This primordial rock is of igneous origin, and on it were deposited the first sedimentary strata—which latter, in their turn, became the base of another class of sedimentary strata; and so on, until we arrive at what is now the uppermost or outside coating or surface of the globe. Each of these sedimentary deposits became, in its turn, the stage on which the animal and vegetable world, as they existed at the time, lived and grew, and in which they were then entombed and covered over by succeeding deposits; which latter, in

their turn, became stages for the existence, and tombs for the remains, of succeeding races of animals and plants. To render this more intelligible, it must be stated, that while this process of the formation of the crust of our globe has been going on, portions of the beds of the seas and lakes have, by reason of internal disturbing forces, been frequently raised and elevated so as to become dry land; while, on the other hand, portions of the dry land have as frequently been depressed so as to have become submerged. There has, therefore, been a continual variation of the geographical limits of the land since its first appearance above the surface of the waters. And thus it is, that districts which have, at one period, been the abode of submarine creatures, have, at another, been covered with land vegetation, and become the habitation of terrestrial animals.

Before we enter on the consideration of the stratified rocks and their contents, it will be necessary briefly to examine the nature and origin of the unstratified granite base on which they rest.

That our planet was originally an incandescent fluid mass, there is little reason to doubt. The theory of internal or central heat no longer rests on conjecture, but on well-established facts. The shape of the earth, which is that of an oblate spheroid, flattened at the poles, and expanding at

the equator, is exactly that which a fluid mass revolving round a fixed axis would assume. According to Humboldt, "the geometrical form of the earth reveals its earlier condition; an ellipsoid of revolution indicating a once soft and fluid mass." Moreover, we find by actual experiment at the present day, that as we descend in mines towards the centre of the earth, the heat gradually increases, and with such regularity, that the depth of the mine can be ascertained by the state of the thermometer[1]. Again, the high temperature of water which rises in very deep borings of Artesian wells, and the occurrence of volcanoes ejecting masses of glowing and molten earth, hot mud, gases, and liquids, from fissures in the earth's surface, are strong evidences of the increase of heat to very considerable depths in the upper terrestrial strata; and by analogy we may conclude, that it continues to increase to the centre of the globe.

The true theory would therefore appear to be,

[1] From thermometric observations which have been made in deep mines, and on the temperature of the water rising in Artesian wells, it has been ascertained, that as we descend from the surface into the depth of the earth's crust, the increase of temperature is 1° for every 50 feet of depth, which is an increase at the rate of 100° per mile. According to Humboldt, if we suppose this increase to continue in arithmetical ratio, a stratum of granite would be in a state of fusion at a depth of nearly 21 geographical miles.

that the globe was originally a mass of matter, kept in a state of igneous fluidity by extreme heat, but which, cooling down by radiation into space, has become partially consolidated by progressive condensation, beginning at the surface, and advancing towards the centre. This theory of internal heat, and the gradual cooling down of the globe, so as in process of time to be coated with a solid stony mass, is now received by the best-informed philosophers as a fundamental and well-established fact; and it will be found to be of great assistance in the elucidation and explanation of many geological phenomena, and will also serve to clear up much that may appear to be obscure and apparently unmeaning in the Mosaic narrative of the creation.

It is to be observed, that the effect of this process of refrigeration must have been to condense the gases capable of constituting the two fluid substances, Water and Air, round and upon the globe. Water is formed by the chemical union of the two gases, Oxygen and Hydrogen; and it has been experimentally decomposed into these two constituent elements by dropping on it fused globules of melted platinum intensely heated. It has also been shown by Dr. Romney Robinson, that as the temperature of water is increased up to 212°, *the chemical affinity* of its

elementary gases is lessened, and eventually destroyed. Hence, it has been suggested, that when the temperature is increased to a great extent, such as that which did once exist at the surface, and which we have reason to know still exists in the interior of our globe, the gases may intermingle without a tendency to unite, being kept separate by the intensity of the heat. It follows from this, that if our planet was originally a molten fluid mass which had gradually cooled down until a crust had formed on it, as the elementary gases were thus refrigerated the chemical affinities gradually came into action, and the Oxygen and Hydrogen combined so as to form the compound Water. In the same way, at a certain point of surface temperature, by the union of Oxygen and Nitrogen, its constituent gases, Air was formed.

This affords us a glimpse of the process by which the Almighty enveloped our planet with its two transparent robes of Water and Air, without which it could never have become a fit habitation for the animal and vegetable kingdoms which have successively occupied it. For, in the perfecting of his works, God has always acted consistently, and in accordance with those laws which He ordained at the creation of the first elements of mundane matte and in the production of his

highest and most minute effects, He is the same yesterday, to-day, and for ever. These principles are of importance in our estimate of the order, or relative periods, of the formation of Water and Air, with respect to the other items of the creation; because we know from chemical science, that water could not have been formed until after the creation of the pre-existing gaseous elements; and also, that the Globe must have cooled down to a certain degree of temperature, before that the gases could have combined in that chemical union which contributed to the formation of the Water and the Air with which we are surrounded.

The external crust of our planet, which was thus formed by refrigeration, is the *granite formation:* and its hard crystalline character, and the absence of all appearance of stratification, are additional evidences of such being the true history of its nature and origin. This surface, thus formed by the cooling down of the molten mass, being covered with water, and still in a high state of temperature, and being subject also to constant eruptions of molten earth, mud, and gases from beneath, a considerable disintegration of the particles of the granite must have been occasioned; which, being mingled with the water and vapour, generated a deposit, that becoming gradually

solidified and indurated, formed at the bottom of the ancient ocean the first layers of stratified rock. The rocks which are found to rest immediately upon the granite show that such was their origin, as they are manifestly stratified and composed, for the most part, of the disintegrated materials of the underlying granite. In like manner, the higher strata, or systems of rocks, will be found to have been, to a great extent, produced by the degradation of rocks older than themselves. The various gases, and newly-created substances, both animal and vegetable, have, of course, caused corresponding variations in the natures and textures of these stratified rocks; but there can be no doubt but that all of them, from the primordial granite upwards to the present surface of the globe, have been formed in the manner described.

These different strata of the earth's crust vary in thickness; but in the aggregate, as we shall presently find, they would, *if regularly superimposed*, extend to a depth of 82,600 feet, or upwards of 15 miles from the surface downwards to the granite. It is evident, therefore, that if they had remained in a state of tranquillity after their deposition and induration, resting conformably on each other like the coats of an onion, man could have ascertained nothing respecting the

structure of the greater part of them, or the nature of the organic remains with which they abound. Their unattainable depths in the earth would have preserved their secrets from his inquiring spirit; and the wondrous creations of the primeval ages, which have been brought to light by the geologist, would never have been made known to the human race. But by the agency of the central heat of the globe, the lowest of these strata have been brought within our reach. This disturbing power has, from time to time, during the formation of the several series of rocks, displayed its activity in earthquakes and volcanic eruptions; and by protruding the expanding masses of igneous rocks from below, and elevating them into mountains, the superincumbent layers of stratified rocks have been upheaved along with them, and thereby the disrupted edges of the lower strata have been exposed to view, and with their contents submitted to the inspection of the geologist. The effect of these upheaving forces in facilitating the inspection of the lower strata, has been illustrated by a pile of books packed in a chest or deep box. If they are piled on their sides, over each other, it is obvious that the contents of the lower volumes could be ascertained only by taking out those that were lying above it; whereas, if the same books were placed vertically in the same box, like books on the shelves of a

library, the contents of each and all could be read off on their lettered backs, without labour or difficulty.

Without this disturbing influence, and the elevation of mountain chains, our planet would have consisted of horizontal strata regularly superimposed upon each other. "From pole to pole, under every region, continents would have presented to the eye the dreary uniformity of the Llanos of South America, or the steppes of Northern Asia; the vault of heaven would have every where appeared to rest on the unbroken plain, and the stars to rise and set as in the horizon of the ocean [2]." But at all periods, since the formation of the earth's crust, subterraneous forces have been diversifying the surface—elevating in one place, and depressing in another.

We now come to a consideration in detail of the several systems of the stratified rocks, which have been, at successive periods, and under different circumstances, deposited in the manner described, from the granite base upwards to the present surface of the earth. These various strata are divided by geologists into three classes—the *Primary*, the *Secondary*, and the *Tertiary*. Each of these divisions comprise several subordinate component strata, which are distinguished by their composition, texture, and the fossil remains of the

[2] Cosmos, vol. i. p. 242.

plants and animals which are found in them. The *Primary* comprises the Azoic or bottom rocks (sometimes denominated the Cambrian), the Silurian, the Devonian or Old Red Sandstone, the Carboniferous or Coal system, and the Permian. The *Secondary*, which succeeds, comprises the Trias and Oolite, and the Cretaceous or Chalk formation. And the *Tertiary* consists of the Eocene, Meiocene, Pleiocene, and the Pleistocene, or superficial deposits.

The following table shows these different formations, and the estimated thickness of each;—

	Feet.
PRIMARY.	
Azoic, or Cambrian	26,000
Silurian, Lower and Upper . . .	30,000
Devonian, or Old Red Sandstone .	9,000
Carboniferous, or Coal	10,000
Permian	2,000
SECONDARY.	
Trias and Oolite	2,500
Cretaceous, or Chalk	1,100
TERTIARY.	
Eocene, or *lower tertiary*	2,000
Meiocene, or *middle tertiary* . . .	
Pleiocene, or *upper tertiary* . . .	
Pleistocene, or *superficial deposits* .	
	82,600

The foregoing table exhibits the relative positions, or order of sequence, of each of these strata, reckoning from the granite upwards, though it is not probable, or even possible, that there can be any particular part of the globe at which the whole series is to be found. Some of them will always be absent, inasmuch as they were severally and respectively formed, as we have explained, by deposit at the bottoms of the then existing waters; and therefore, wherever dry land existed during such periods, no such strata could, of course, be deposited. Nevertheless, whatever the strata may be in any locality, *the order of their sequence is fixed and invariable.* For instance, Silurian strata are never found above, nor Carboniferous strata below, the Old Red Sandstone: and so of the others. It would, therefore, be a fruitless task to seek for coal beneath a formation of Silurian or Devonian Rocks, or to expect to find chalk below a vein of coal.

THE AZOIC, OR CAMBRIAN SYSTEM.

That part of the Azoic system of stratified rocks, which was deposited immediately upon the granite floor, or primitive crust of our planet, has been commonly termed by geologists, Gneiss and Mica Schist. Though manifestly stratified, it is of a crystalline texture, and differs little in sub-

stance from the underlying granite, having been formed of its disintegrated materials. Immediately above, and in continuation of this, we find a deposit, or formation of sediments, composed of mud, sand, and pebbles. These are of enormous thickness, computed by Sir Roderick Murchison to extend to the depth of 26,000 feet[3], and which must have occupied a vast extent of time in their formation. The leading characteristic of these bottom rocks is, that they are *wholly unfossiliferous;* no traces of plants or animals, or of their organic remains, having been discovered in them. On this account, they have been termed Azoic (lifeless): and geologists have naturally concluded, that throughout the period which was occupied in their deposition, *the era of physical life on our globe had not commenced.*

This system of rocks is thus described by Professor Ansted:—"These lowest and oldest of the sedimentary strata, whose antiquity is, in many places, unquestionable, which repose on the bare skeleton—the rocky framework of the earth—thus occupy a fixed, a prominent, and an important place among the rocks of which the earth's crust is made up. They also mark a strange and dark passage from that state which has been mentioned

[3] Siluria, p. 174.

as chaotic to a condition of regular and quiet deposit; they are, however, as far as we can tell, and with reference to other rudimentary rocks, Azoic (lifeless); but they form a class almost as *widely spread*, and as *distinctly universal*, as the granitic rocks themselves. . . . On their surface, however, all was then bare and desolate—not a moss, not a lichen then covered the naked framework of the globe; not a seaweed floated on the broad ocean; not an animalcule was present in the whole of the wide expanse—all was still, with the stillness of absolute death. The earth was prepared, and the fiat of the Creator had gone forth: but there was as yet no inhabitant, and no form of life had been introduced to perform its part in the great mystery of creation."

At the time of the deposition of the sediments which form the substance of these bottom rocks, the surface of the earth must have been of an exceeding high temperature. In these early stages of progressive creation, the cooling process had not sufficiently advanced to admit of the existence of animal or vegetable life; and hence it is that no fossil remains are to be found in them; and from the proximity and strength of the internal heat of the globe, volcanic action, and ejections of hot steam, mud, gases, and liquids, must have been frequent and violent. The result of such

conditions would be, that the disintegration of the granite base would be very considerable and rapid, and being mixed up with the argillaceous mud, steam, and the various gases which, even at the present day, issue from the earth in volcanic districts, a sediment would be formed, which would exactly correspond with that which the bottom rocks now present as the material of their composition.

This, and the succeeding formation (the Silurian), have been sedulously explored, and their nature, texture, and fossil remains accurately described by the most able and accomplished of geologists, Sir Roderick Murchison. He states thus generally the result of his researches. "This is the important fact to which attention is first directed; for in such instances the geologist appeals to the Book of Nature where its leaves have undergone no great alteration. He sees before him an enormous pile or series of early subaqueous sediment, originally composed of mud, sand, or pebbles, the successive bottoms of a former sea, all of which have been derived from pre-existing rocks; and in these lower beds, even where they are little altered, *he can detect no remains of former creatures.* But lying upon them, and therefore evolved after them, other strata succeed, in which some few relics of a primeval ocean are discernible,

and these again are every where succeeded by newer deposits in which many fossils occur. In this way, evidences have been fairly obtained to show that the sediments which underlie the strata containing the lowest fossil remains constitute, in all countries which have been examined, the natural base or bottom rocks of the deposits termed Silurian."

From the foregoing testimonies of those best qualified to pronounce on such subjects, it appears to be a well-established and unquestionable fact, that for long ages after the formation of the granite crust on the molten mass of terrestrial matter, *the globe was devoid of organic* life, animal or vegetable. This long period is not, either as regards its duration or its distance from our era, to be calculated by days or years, or by any other known measure of time. Its extent is represented by the vast pile of these sedimentary bottom rocks, computed by Sir Roderick Murchison to be 26,000 feet (nearly five miles) in depth, which were formed by the slow deposit and induration of the muddy sediment of which they are composed; and its distance from our own times can only be estimated by the long periods which must have been occupied by the formation of the various systems of rocks, which we shall find to have been successively deposited between the era of the Azoic

system and that of the human race. *The Azoic period*, or the time occupied by the slow operation of depositing sediment on the granite bed of the ocean to the depth of nearly five miles, must have been vast indeed; but still it manifestly had a commencement and a termination, which is all that it concerns us to know of its duration.

It is a strange and interesting circumstance, that we can thus, with the aid of the geologist, ascend the stream of time to a period at which our planet was lifeless throughout its whole expanse; and that we can arrive at a *beginning* of animal and vegetable creation, and find ourselves in a position to contemplate and ascertain the state of the globe, before that the first pulsation of organic life had stirred within its precincts. Here is instruction of a novel and solemn description. In such paths of knowledge, we may be said to walk with God, and to share his counsels before our world of life began—when as yet his creative spirit had not poured light and vitality on a scene that is now furnished and adorned with the countless glories of animated nature; and we no longer believe, merely because it is written, that there was a beginning of life and order, but because we have the additional evidence of our senses to attest the fact. It is true that this evidence is only negative in its nature, but the

succeeding systems of rocks, and their contents, will show that it is as conclusive and convincing as any direct and positive evidence could be; for ascending from this unfossiliferous formation to the next formation which rests upon it, we shall there discover the fossil remains of animal life of the *lowest class of organic existences*, expanding gradually as we proceed upwards, through the other systems, into those of *higher orders*, until we reach the present surface of the earth, where we find the highest of all the orders of organic life in the form of man. Therefore, the negative evidence, arising from the absence of all appearance of life in the Azoic system, will be confirmed by the direct evidence of the commencement of life in its *lowest form* in the next succeeding system, and of its gradual progress from that commencement to the human era.

We now proceed to the consideration of the next succeeding system of rocks, which has been termed,

THE SILURIAN SYSTEM.

This formation, which rests conformably on the Azoic rocks, has been denominated by Sir Roderick Murchison, "the Silurian," in consequence of the district in this country in which it is most fully developed, having been, at one period of its

history, the locality of the ancient tribe of the Silures, extending through the greatest part of South Wales and the western counties of England. These rocks, which are divided into two classes, the lower and upper Silurian, and the fossil remains with which they are charged, have been fully and faithfully depicted by the foregoing eloquent writer in his "Siluria;" and the nature and organization of the several species of the creatures which had their being during the primeval period of the deposition of the system, have been carefully investigated and graphically pourtrayed by him. For a detailed description and accurate delineation of these first inhabitants of our globe, the reader must resort to the foregoing work, which will supply him with all the information that the researches of the most inquiring of geologists have brought to light on the subject. It will be sufficient for our purpose to state, that the only living creatures that were to be found on the face of the globe during the Silurian period, as evidenced by their exhumed fossil remains, were of the classes or families of Zoophytes, Mollusks, and Crustaceans—all of them *submarine invertebrate animals*[4]. Of the vegetable creation,

[4] The great division of the animal kingdom is into *Vertebrates* and *Invertebrates*. The Vertebrates comprise all those animals which are furnished with a vertical column, or backbone, and its

no traces are to be found beyond the casts of some specimens of Fucoids or Sea-weeds.

Of the family of Zoophytes, creatures that partake of both the animal and vegetable nature, and which therefore rank low in the scale of physical organization, there are many species. They appear to have been *the earliest* of created organic beings; and the most remarkable are the Graptolites—small serrated creatures which in form resemble a comb—Corals of various descriptions, and Encrinites, or Stone-lilies, so called from their resemblance in form to the common lily. Of these latter there appears to have been a great variety of species, and judging from the immense extent of their remains, which occupy, and actually compose successions of marble strata many feet in thickness and many miles in extent, the beds of the primeval waters must have been in many parts studded with them. According to Dr. Buckland, the Entrochal marble, of great extent in Europe and America, is often almost as entirely made up of the petrified bones of Encrinites, as a corn-rick is composed of straws. This Zoophyte is a species of star-fish fixed on the top of a flex-

accompanying internal skeleton. To this class belong Fishes, Reptiles, Birds, Mammals, and the Human race. The Invertebrates are those animals which have no backbone; and to this class belong Zoophytes, Mollusks, Crustaceans, and Insects.

ible stalk, rising from, and fastened to, the bottom of the water, furnished with long tentacles, or fingers, armed with suckers like the cuttle-fish, stretching forth in every direction, and with which they seized their prey, and conveyed it to a stomach of simple structure, containing viscera, with one aperture. The body, stalk, and fingers, or arms, were composed of numerous calcareous plates and rings, amounting to many thousands in each of these members, curiously elaborated, and fitted with such nice contrivances to each other, that the animal could turn and bend in all directions without fracture or dislocation, either in pursuit of its prey, or under the influence of the tides and currents of its native seas. Though so abundant in these primeval ages, there are only two now existing representatives of the class, viz., the Pentacrinus Caput Medusæ, and the Cornatula, both of them exceedingly rare.

Another class of the Silurian creation are the Mollusks, which are pulpy boneless animals, most frequently furnished with external shells, like the oyster or muscle of the present day; or without a shell, like the common snail. Of these, the fossil contents of this system of rocks evidence a vast numerical extent of species, both Bivalves and Univalves.

Of the Bivalve, or double-shelled species, the

most abundant of this formation belong to the group of Lingulæ, Brachiopods, and Rhynconella, sometimes called Terebratulæ, which, from their formidable apparatus for destruction, in the form of long tentacles or arms, protruding from their shells, have been termed "the scavengers of the ancient seas," feeding upon other living species, or such animal matter as found its way to their haunts in the great depths. Of the Univalve, or single-shelled species, the principal were the Gasteropods and Cephalopods, which were also carnivorous, represented in the present day by the Nautilus and Cuttle-fish, and, like them, capable of locomotion, and most voracious and destructive in their nature and habits.

Of the Crustaceans, which are now represented by the Lobsters, Crabs, Shrimps, Crayfish, and other marine animals of that description, the most remarkable, and most highly developed, is the once numerous and extensive, but now extinct, family of Trilobites, of which there was a great variety of species. In shape, this animal resembled most nearly the familiar form of the common Woodlouse (though of course on a comparatively gigantic scale); but the body was divided into three sections by two longitudinal grooves, giving it a trilobed appearance, from whence its name has been derived. It was furnished with an eye,

which has been preserved in some of the fossils, in such a state of perfection, as proves to demonstration that the nature of the water, the air, and the light, must have been substantially "the same at the time when Crustaceans endowed with the faculty of vision were first placed at the bottom of the primeval seas, as at the present moment." Dr. Buckland observes,—"This point deserves peculiar consideration, as it offers the most ancient, and almost the only example yet found in the fossil world, of the preservation of parts so delicate as the visual organs of animals that ceased to live many thousands, and perhaps millions of years ago[5]." The animals of the present day which approach nearest in form to the Trilobite, are the Limulus, or King Crab, and the Serolis.

The Crustaceans are, according to Sir Roderick Murchison, to be considered as the highest type of life of the Silurian division; and he goes on to state, that "it is indeed a remarkable fact, that the most sedulous research in many parts of the world has failed to discover the trace of any vertebrate animal in the lower division of the Silurian system. All the marine animals from Zoophytes to Crustaceans, and which probably amount to more than 1000 species already known, belong to the invertebrated classes, and no true

[5] Bridgewater Treatise vol. i. p. 396.

fish has yet been discovered:" and his conclusion is, that "the name Silurian marks, therefore, the first series of fossiliferous deposits, throughout the great mass of which *no vertebrated animals have been any where discovered*[6]."

Besides the foregoing invertebrates, casts of Fucoids or sea-weeds, flowerless and seedless, are found in the Silurian rocks; but, with respect to *land plants*, no trace of their existence is to be discovered until we arrive at the very top of this system, and just beneath the lowest beds of the Old Red Sandstone, which is the next in succession; and the first evidence of the existence of vertebrate fishes has been found in the same position. In fact, as the highest authority on this subject states, "the very long Silurian era had nearly passed away before trees grew upon the land, or fishes swam in the sea; . . . . the Silurian rocks extend over areas as large, if not larger, than any great system of the following periods; and yet in these alone, I repeat, is there an *entire absence of an arborescent vegetation*[7]."

As then, in the Azoic or Cambrian system there are no traces of either animal or vegetable life, so in the Silurian or Protozoic system, as it has been termed, which is immediately subsequent in point of time, there is no trace of animal

[6] Siluria, p. 205—240. [7] Ib. p. 475.

or vegetable existence, beyond submarine invertebrates—Zoophytes, Mollusks, Crustaceans, and Fucoids—the first forms in which the mystery of life presented itself on our planet.

These Silurian rocks, as well as the underlying Azoic rocks, are found largely developed in every part of the earth where search has been made for them; and in all latitudes, whether in the torrid or temperate zone, the same species are found. It is probable, therefore, that the waters in which they were deposited must have extended all over the globe; and the circumstance that no land animals or plants were in existence during these periods, corroborates the conclusion that in the Cambrian and Silurian ages the ocean encircled the earth, and spread an unbroken expanse from pole to pole.

"Quâque fuit tellus, illuc et pontus et aer."

It is true that many of our geologists have assumed that dry land, to some extent, prevailed throughout the Silurian epoch; but when we come to examine the grounds for such an assumption, we find them altogether inadequate to establish the fact of any necessity for the existence of dry land during that period. Sir Charles Lyell states "that there never was an universal ocean since the planet was inhabited, or rather since

the oldest groups of strata yet known to contain organic remains were found, is proved *by the presence of terrestrial plants, or by the indications of shores in all the older formations*[8]." The first of these reasons cannot be said to have any application to the Azoic or Silurian eras, as it is now well established that there are *no traces of terrestrial vegetation in either of them;* and the only indication of the existence of shores in these older formations is stated to be the great disintegration exhibited in these strata. "In our times, this process (disintegration) is usually seen taking place chiefly in the atmosphere, and *at a point where land and water meet;* in a much less activity below the surface of the ocean. It would thus appear likely that there was dry land in the eras of the earliest stratified formations, though, from whatever cause, it bore no vegetation, and sustained no animals, or was only a scene of life in certain rare and favourably situated places[9]."

This is obviously not conclusive as to the existence of land at those periods; more especially, when we consider that the present state of the globe, in relation to the causes of disintegration, is very different from the state of the globe in

[8] Lyell's Principles of Geology, p. 665.

[9] Vestiges of the Nat. Hist. of Creation, p. 40, 6th ed.

those primeval times, when disintegration was accelerated by volcanic action beneath the waters, in a much higher degree than it could have been by any atmospheric action. When, as Hugh Miller well describes, "upheaving fires from the abyss, and ocean currents above, had contended, in sublime antagonism, the one slowly elevating the entire tract, the other grinding it down and sweeping it away." There is, therefore, no necessity for a resort to atmospheric action on the materials of the globe, and, consequently, no necessity for the existence of shore, or dry land, to account for the phenomena of the great disintegration that appears to have taken place at the period of the deposition of these lower strata. So that *it may be true*, that no dry land was in existence on the globe until the close of the Silurian system, when the first unerring symptom of its existence, in the form of the fossil remains of terrestrial vegetation, makes its appearance. Nay more, it is rather in accordance with the economy and regularity which prevail throughout all the works of creation, that the appearance of land and land vegetation should be simultaneous, or nearly so. The first discovered fossil remains of a plant tells the same tale to us that the olive branch revealed to Noah in the days of the flood, that dry land had begun to appear above the surface of the waters.

Such being the case, our planet, during the Silurian epoch, presented the aspect of an unbroken expanse of waters, inhabited by a population of exclusively marine invertebrate animals. Graptolites, Lingulæ, and other Bivalve Mollusks, crawling on the muddy beds of the shoreless ocean; myriads of Encrinites, like forests of marble lilies, waving gracefully to and fro on their elegant stalks, and spreading their numerous tentacles abroad in search of their prey; and the various species of the Trilobites, Nautili, and Ammonites roaming about, and with equally voracious Brachiopods and Terebratulæ, keeping down the increasing population of the waters; showing that while the globe, and the life with which it was furnished, presented very different appearances from those of after days, the economy of nature has always been the same, regulating and securing the just proportion of creatures to the means of their subsistence, by the introduction of one class of animals to prey upon the others.

We are now at the close of the Silurian epoch. No dry land or land vegetation—no Quadruped, Reptile, Bird, nor any other vertebrate animal, has yet appeared on the stage of existence. Zoophytes, Mollusks, and Crustaceans are the sole living tenants of our planet. In humble form and lowly guise, life has commenced the slow and

steady progress, by which it has advanced upwards, through various forms, to a being of intelligence and responsibility; and is still advancing onwards, until it shall merge again in the eternal and the infinite.

THE DEVONIAN, OR OLD RED SANDSTONE.

We now ascend another step in geological chronology, and enter on a period represented by the deposition of the strata or systems of rocks which rest on the Silurian, and which, from their composition, have been styled the "Old Red Sandstone." It is more generally known as "the Devonian," from the fact of its being largely developed in our own country, in the southern parts of Devonshire. It is also found in many other parts of England and Scotland, and throughout Europe, more especially in Russia, and in America, and is thus introduced to our notice by Sir Roderick Murchison: "During the accumulation of nearly all the Silurian deposits, the bottom of the sea was, to a very wide extent, successively occupied by deposits of dark grey coloured mud. At the close of that period a great change occurred in the nature and colour of the sediment, over large areas of those ancient seas. In and around the Silurian region of Great Britain, for example, the grey mud was succeeded

by red deposits, for the most part sandy; their colour being caused by the difference of iron oxides in their waters[10]." The metallic oxide by which these deposits were coloured, was no doubt of volcanic origin, and must have been attended with fatal effects to the then existing inhabitants of the deep, many species of which disappear, and are not again to be discovered in any of the succeeding formations.

The introduction of this system of rocks, all geologists agree, was accompanied with violent and extensive volcanic disturbances, which broke up the previous formations in numerous places, and upheaved them, with the protruded granite, from the waters into dry land, forming extensive mountain ranges. Geological research has informed us that, among others, the Grampian and Welsh ranges, the Pyrenees, Hartz mountains, Dofrafeld, Uralian, Himmalayah, Atlas ranges, Mountains of the Moon, and other African ridges, the Andes, and Alleghanies, were all elevated at this period[11].

[10] Siluria, p. 241.

[11] The relative ages of mountains are ascertained, on the principle that their elevation must have necessarily intervened between two periods, that is to say, between the deposition of the strata which have been upheaved and inclined, and of those which, extending horizontally above them, show that they must have been deposited subsequently to the inclination of those

We have seen that the first appearance of land plants was at the very top of the Silurian rocks, where the Old Red Sandstone rests on them. In the same position, the first Icthyolites, or organic remains of fishes, the earliest of the vertebrates, were discovered. "The multiplied researches of the last twenty years have failed to detect the trace of a fish, amid the multitude of all other marine beings in the various sediments which constitute the chief mass of the Silurian rocks. . . The Silurian, except at its close, was, therefore, a series in which there appeared no example of that bony framework of completed vertebræ, from which, as approaching to the vertebrate archetype, the comparative anatomist traces the rise of creative power up to the formation of man[1]." Thus the principal features and characteristics of the system are the introduction of land vegetation and of vertebrate fishes on the stage of existence. From the fossil remains, we find that the land plants, which were at first few and small, increase considerably in number and dimensions as we proceed upwards and onwards, until they expand into the rank

strata. Thus the Silurian strata are found leaning against the sides of those mountains, and the Old Red Sandstone forms an acute angle with the Silurian. They must therefore have emerged from the deep at the close of the Silurian era.

[1] Siluria, p. 460.

luxuriant vegetation from which the extensive coal beds of the Carboniferous formations were, as we shall presently see, furnished.

Zoophytes, Brachiopods, Gasteropods, and Cephalopods are still abundant; Crustaceans have diminished. But the new creation which characterizes and distinguishes the zoology of the Devonian, from that of the Silurian, system, is the Vertebrate Fish, of which upwards of 1600 species have been already named and described. For a detailed account of these, the monarchs of the creation in their day, we must refer the reader to the works of Cuvier and Agassiz, and to the interesting writings of the eloquent author of "The Old Red Sandstone." We shall only notice a few particulars connected with them, which will be found hereafter to bear on the subject of our inquiry.

From the Icthyolites, or fossil remains of these fishes, we learn that the first created of the class differed considerably in character and appearance from their descendants, which now fill the waters of the earth. All the fishes of this formation were cartilaginous, clad in strong integuments of bone composed of enamelled plates, instead of the horny scales which cover those of more recent times; and have been distinguished by naturalists into two classes, derived from the arrangements of these

osseous plates on the body of the animal, viz. Placoids and Ganoids. Those comprised in the first of these classes, are coated with these irregular enamelled plates, fitted edge to edge, like a tesselated pavement; in the second, the bony plates are placed regularly over each other, like the scales of the common fish of modern times. Besides this bony armour, there is another remarkable peculiarity which characterizes these ancient tenants of the deep, in the structure and form of the tail. All of the fishes of our own era, with very few exceptions, are furnished with what are termed bilobed or homo-cercal tails, that is to say, the tail commences at the extremity of the vertebral column, and branches out into two equal sections, as we see in the salmon, perch, herring, and all other fishes of the present day, with the exception of the pike, sturgeon, and dog-fish,—while, in the fishes of the older formations, the vertebral column is continued into the tail; or, more properly speaking, the tail is developed on both sides of the spine, but much more largely on the under, than on the upper, side, forming what is called a one-sided, or hetero-cercal tail, which, therefore, resembles a caudal fin rather than a tail. This one-sided formation of tail is invariably united to the bony or enamelled covering; and the order to which they belong appears to

have continued throughout all the different systems, from the Old Red Sandstone to the Chalk, where they became extinct, and are succeeded by the fish with horny scales, and bilobed or homocercal tails, which are still in existence[2].

It is a well-known fact, that fish can sustain a higher degree of temperature than any other animal, from the fact of their being found in hot springs in different parts of the world, where no other form of *organic* life could exist; and it has been suggested by Dr. Buckland, that the use of the thick bony and enamelled scales, surrounding like a cuirass the entire bodies of these ancient fishes, may have formed a defence against the injurious effects of waters of a high temperature. In connexion with, and in confirmation of this hypothesis, Hugh Miller has observed, that about the time of the disappearance of this ancient race of fishes, we have the earliest indications of the commencement of the *alternations* of summer heat and winter cold, in the appearance of annual season rings in the fossil trees. "*Just as winter began to take its place among the seasons, the fish*

[2] The horny scaled fishes of modern times are divided by naturalists into two classes, viz. Ctenoid and Cycloid; and are distinguished by the forms of their respective scales; those of the former being jagged on the edge like the teeth of a comb, as in the perch, while those of the latter are smooth and circular, as in the herring.

fitted for a highly-heated medium disappeared: they were created to inhabit a thermal ocean, and died away as it cooled down[3]." Thus the hypothesis that the Placoid and Ganoid orders of fishes were adapted to, and inhabited, tepid seas, is confirmed by the interesting fact, that they begin to disappear when the fossil remains of the succeeding formations attest that the internal temperature of the globe had so far cooled down, that the influence of the sun could operate to the extent of producing a variation of seasons on the surface of the earth. The presence, therefore, of these ancient forms of marine life, are, to some extent, an evidence of the tepid state of the primeval waters in which they lived.

What then is the history which has been traced and expounded by the geologist of our planet's existence, during the long period represented by the 10,000 feet of the Old Red Sandstone which were deposited on the Silurian Rocks? Its dawn was ushered in by a burst of volcanic eruptions, upheaving in different localities the underlying granite, and lifting up with it the Azoic and Silurian strata which were spread over it; and thereby forming dry land above the surface of the waters. Land vegetation soon made its appearance to decorate the new-born earth; and vertebrate fishes were

[3] "The Old Red Sandstone," p. 161, 162, 5th ed.

at the same time added to the previously existing submarine invertebrate denizens of the deep ; while these newly-created mailed animals attest a continuance of a high temperature on the globe throughout the whole period. The progress of the creation is manifest and well defined. We shall now advance another step in the examination of our strange and interesting stony record of the remote past.

THE CARBONIFEROUS SYSTEM.

The system which succeeded, and rests on, the Old Red Sandstone, has been termed "The Carboniferous." The deposits of this era were of various descriptions—Sandstone, Shale, and Limestone, with two other rock substances, of no little importance, which make their appearances for the first time, viz. Ironstone and Coal. But though both of these formations are largely developed, it is the latter that has always been considered to be the characteristic and distinguishing feature of the system ; and the investigation of the constitution of this mineral, and the circumstances under which it was formed, will prove, not only highly interesting, but of the greatest assistance to us in the inquiry in which we are engaged.

It is a fact, now admitted by all naturalists and chemists, that terrestrial vegetation was the sub-

stance of which the masses of coal, which are found in such abundance beneath the surface of the earth in various parts of the world, have been formed. The trees and herbage of the primeval forests were the raw material out of which this source of so much of the conveniences and comforts of life has been manufactured, and preserved through untold ages for the sole benefit of the human race. The main ingredient of the mineral is Carbon, and it is also the chief element which enters into the composition of the vegetable creation. Moreover, as we shall presently see, it reveals, on close inspection, a vegetable structure, which leaves no doubt of its organic origin. But the most exuberant and luxuriant vegetation that has ever been witnessed by the eye of man in the most prolific regions of the now existing earth, is mere waste and barrenness, when compared with the profuse and gigantic vegetable productions of the primeval period, which formed the basis of the coal measures.

These coal measures consist of bands, or veins, of the mineral substance of Coal, alternating with, or separated from, each other, by interposed strata of Sandstones, Shales, beds of Limestone, and Ironstone. This position and structure of the formation has given rise to a difference of opinion among geologists as to the nature of the process

by which the vegetable has been converted into the mineral substance. All agree that the transmutation has taken place by submergence of the vegetation under water, sand, and gravel, and the exclusion of air; but whether the land on which this luxuriant vegetation flourished and decayed, was submerged and covered over with sand and shale, and again elevated for the production of another area of vegetable matter, to be again submerged and formed into another and upper vein of coal,—or whether the great masses of the vegetable matter of which the coal measures were composed, were from time to time drifted into lakes and estuaries by rivers and inundations, forming deltas of vast extent and thickness, has been the subject of much controversy and discussion; but as to the substance of which the Coal measures have been formed, there can be none. The vegetable remains have completely changed their character and colour; but by chemical analysis the vegetable structure can be detected; and also, by cutting the coal and polishing it down into thin transparent slices, the fibres and cells of the plants of which it is composed are plainly revealed by the microscope: and from the same source we discover, that the nature of the plants were similar to those which now grow in the clusters of islands which are scattered throughout the tropical seas,

or within the mountain valleys of equinoctial regions.

From this circumstance we learn, that a high temperature must have prevailed in those days even in the polar regions of the earth, inasmuch as the Coal strata are found in great abundance, not only in the temperate, but in the frigid zones —in India and Australia, in the southern hemisphere, and in Melville Island and Baffin's Bay, in the northern. Such a temperature could not have been caused by the influence of the sun in latitudes so remote from each other, and must, therefore, have proceeded from the earth itself. Here again, we have evidence of the existence of the internal or central heat of the globe, and of the continuance down to this period of its history. The true explanation is, that the incandescent globe had not sufficiently cooled to admit of animal or vegetable life in the Azoic or Cambrian era, but was sufficiently cooled, during the Silurian and Devonian epochs, to permit of the creation and existence of Zoophytes, Mollusks, Crustaceans, Fucoids, and certain classes of Fishes and Plants; and had become genial enough, during the Carboniferous era, to foster the rich luxuriant vegetation that formed its distinguishing characteristic. The extensive exhalations of carbonic acid gas which issued from the tepid earth, mingling

with the atmosphere, must have assisted this profuse growth. According to Humboldt, "it is very probable that in an earlier condition of the globe, far greater emissions of Carbonic acid gas mingled with the atmosphere, and heightened the process by which plants assimilate carbon; and thus vast forests were formed, which in subsequent revolutions were destroyed, and inexhaustible stores of fuel (lignites and coal) were buried in the terrestrial strata thus forming at the surface[4]."

But not only have geologists ascertained the general vegetable structure of the coal measures, their researches have disclosed the nature and character of the several plants which enter into the composition of the mineral; and which, therefore, must have clothed the earth at the period of their formation. A brief consideration of the various species of the trees of this primeval era, and of the climatal conditions of the earth and atmosphere necessary for their production, will prove, not merely interesting and instructive as a scientific inquiry, but of great value in its consequences to the cause of the truth and inspiration of the Scripture record of the creation.

The plants which have contributed most extensively to the formation of Coal, are referable to

[4] Cosmos, vol. i. p. 190

five different genera, viz., Ferns, Calamites, Lepidodendra, Sigillaria, and Stigmaria. They are thus enumerated by Dr. Buckland, and all succeeding geological writers.

FERNS. Of this tribe of plants there is a singular preponderance among the Coal fossils, insomuch that it has been termed the master form or type of the Carboniferous era. In the great Coal formation there are about 130 ascertained species of Ferns, forming about one half of the entire known Flora of this formation[5]; and Mr. Brown, in the Appendix to Tuckey's Congo Expedition, states that the circumstances most favourable to the growth of Ferns are *Humidity, Shade, and Heat*—a fact well known to all botanists.

CALAMITES are the next most numerous of the Carboniferous plants. It is a gigantic reed of the family of the Equisetum, or common Mare's-tail, which is to be seen in great abundance in marshy situations in all latitudes—with this difference, that while the diameter of the Equisetum of the present day rarely exceeds half an inch, the Calamite of the Carboniferous age frequently exceeds a foot in diameter, and is many yards in height. The stems, when found in horizontal, or nearly

[5] Bridgewater Treatise, vol. i. p. 464.

horizontal positions, are *compressed and flattened*, indicating that the plant was *soft and succulent* in its nature.

THE LEPIDODENDRON, of which thirty-four species are enumerated in Brougniart's catalogue of fossil plants of the Coal formation, belongs to the family of Lycopodiaceæ, or Club mosses. They are stated to follow nearly the same law as Ferns and Equisetaceæ, in respect of geographical distribution; and were, therefore, produced under similar climatal circumstances of *shade, heat, and moisture.* They attained an enormous size in the Carboniferous era, the fragments of the stems occurring from twenty to forty-five feet in length, and upwards of four feet in diameter. They are also found *compressed and flattened* in the coal mines, attesting the *softness and succulency* of their structure.

SIGILLARIA are a species of plants unknown to modern vegetation, though very abundant in the Coal formation. They are described by Dr. Buckland as lying inclined at all degrees throughout the coal strata; "but are most frequently prostrate, and parallel to the lines of stratification, and in this position are *usually compressed.*" When erect, or highly inclined, the interior is filled with sand or clay; from which he infers, that "the bark, which alone remains, and has been converted into coal, probably surrounded an axis composed of *soft*

and perishable pulpy matter," which by decay made room for the sand and clay. They attained the extraordinary dimensions of from fifty to sixty feet in height, and from half a foot to three feet in diameter. Brougniart enumerates forty-two species of Sigillaria, and considers them to have been nearly allied to arborescent Ferns.

STIGMARIA, from the length and form of their leaves and branches, were long supposed to have been aquatic plants of a distinct species, trailing in swamps and lakes; and are thus described by Dr. Buckland: "The centre of the plant presents a dome-shaped trunk or stem, three or four feet in diameter, the substance of which was probably yielding and fleshy." It has, however, been discovered, and it is now a well-established fact, that the Stigmaria is the root of the Sigillaria, having been found, in many recent instances, attached to the stem of that plant. Besides the foregoing, some species of Coniferæ, of the Aracaurian tribe, are found among the Carboniferous plants; but they are comparatively few in number.

Thus one half, at least, of the Flora which were the occupants of the dense forests of the Carboniferous era, viz. the Ferns, were of a nature which required a vast proportion and prolonged continuance of *shade, heat, and humidity*, for their extensive production—while the remainder, with the exception

of a few Coniferæ, were, for the most part, if not altogether, though large in their dimensions, *soft and succulent* in their substance—a texture, which is likewise the offspring of similar climatal conditions. We must therefore conclude, that during the growth of the exuberant terrestrial vegetation of the Carboniferous era, there must have been a remarkable combination of these circumstances. The surface of the earth must have been *shaded from the direct rays of the sun*, while the atmosphere must have been charged with both warmth and moisture, producing a steamy vapour most conducive to the rapid and extensive growth of every description of the then existing vegetation. In our own days, we know that the gigantic forests of the damp mountain valleys of the tropics are produced under similar conditions of shade, heat, and humidity, which must therefore have prevailed to a still greater extent during the far more prolific vegetation of the Carboniferous period of our planet's existence.

> "Here lofty trees, to ancient song unknown,
> The noble sons of potent heat and floods
> Prone rushing from the clouds, rear high to Heaven
> Their thorny stems, and broad around them throw
> Meridian gloom."

As regards the fossil remains of animals in this system, they are mainly identical in general cha-

racter with those of the preceding ages, but fewer in number; and such as they are, we find them principally in the limestone sections which alternate with the coal seams. There are, however, some few objects which present an advance in the work of creation. The principal of these are the Sauroid fishes, bearing some traits of resemblance to the family of Saurian reptiles, which form a prominent feature in the succeeding strata. Here also, a few traces of Insects, and of Reptiles of the Batrachian or Frog species, have been discovered; and one specimen of the latter as low down as the top of the Old Red Sandstone. The Batrachian is a connecting link between the fish and the true reptile (Saurian), entering into life in the icthyic form (tadpoles), and passing, at a subsequent stage of its existence, into that of an amphibious reptile.

Such was the state of the globe throughout the period represented by the formation of the coal measures, and the accompanying stratified deposits of limestone and ironstone. A hot, hazy, and damp atmosphere rested on a multitude of islands rising from the deep, or on larger tracts of land deeply indented with shallow bays and estuaries. Dense forests of rank vegetation overspread the marshy soil, intersected by rivers, lakes, and swamps, choked with the trailing roots of the huge

Stigmaria, and other aquatic and succulent plants; while all around, o'er hill and plain, luxuriant ferns, gigantic reeds, and stately lepidodendra arose, and spread forth their foliage with inconceivable rapidity, until the soft and pulpy stems sank beneath their own weight, and successive forests sprang up from their prostrate and compressed trunks. No sunbeam penetrated the clouds that canopied the misty scene,—no sound disturbed the death-like silence that prevailed, save the rushing descent of falling trees, or the discordant croak of the batrachian, or an insect's feeble hum—sole living tenants of the land and air. No other beast moved through the deep thickets, and no bird enlivened the dense foliage. Still and sombre was the aspect of our planet, when she thus became the laboratory and storehouse of those vast treasures of coal and iron, which have so materially supplied the wants, and ministered to the comforts and enjoyments of the human race.

THE PERMIAN SYSTEM.

At the close of the Carboniferous formations, violent volcanic disturbances appear to have broken up and dislocated the coal beds to a vast extent; and on the distorted masses another system of sedimentary rocks were deposited. This system has been denominated the Permian, from the

circumstance of its being developed under favourable circumstances, in that part of Russia which was at one time the site of the ancient kingdom of Perm. It consists of different series of strata, which, according to Sir Roderick Murchison, constitute one natural mass. These strata are the Magnesian limestone and Red Sandstone, which is called the New Red, to distinguish it from the Old Red Sandstone that preceded the Carboniferous formations. The fossil remains are, generally speaking, a continuation of those of the preceding period, with some exceptions; and most of them, including the ancient Placoid and Ganoid fishes of the Old Red Sandstone, occur here for the last time. But the remarkable feature of the system is, that we here find, for the first time, the undoubted traces of the true Reptile, the Saurian, an air-breathing oviparous quadruped, and also of Birds. These Reptiles, though few in number in the Permian strata, became exceedingly abundant and gigantic in the period represented by the next formations, as we shall presently find.

But besides organic remains, we are furnished, in this system, with other and further proofs of the existence and nature of the creatures that lived and moved upon the land during the period of its formation. We allude to the fossil footsteps imprinted by the animals on the mud and sand which

bordered the shores of these ancient seas and rivers, while in a soft state, but which have, since then, become hardened and converted into stone, without obliteration of the impressions—memorials of primeval existences, which have proved more enduring and faithful than the most eloquent inscription on the most lasting monument the art of man could raise.

In the sandstone quarries, which have been opened in various parts of the world, we find extensive surfaces of strata marked with the small wavy ridges and furrows that may be seen on every sandy beach which is covered by the flowing and ebbing tides, or at the bottoms of shallow seas; and which are produced by the rippling action of the waves. From these appearances, it is obvious, that the sandstones on which they are found, once formed the beaches and bottoms of seas which were under the influence of rising and falling tides and winds, as at the present day. In the same places, are also frequently found the impressions of rain drops, which must have fallen in the remote ages in which the sandstones were soft sands; and in some instances, the direction in which the rain was driven by the wind is disclosed, by the slanting appearance of the impressions, and the elevation of the rims on one side, as would occur at the present day, under the

circumstances of rain drops driven by wind on a sandy beach. Thus, in those days of old, removed from the human era by inconceivably long periods of time, the tides ebbed and flowed, the winds blew, and the rain descended on the earth as now—all the processes of nature, and the divine laws by which the physical universe is regulated, were in full operation, though man, or even the semblance of man, was not. But besides these ripple marks, and the impressions of rain drops, casts of Marine Worms, and footprints of Reptiles and Birds are distinctly traceable in the same strata.

On the sloping slabs of some sandstone quarries in Scotland, tracks of some of the creatures which existed while they were in a soft state are plainly visible. They present the appearances of four-footed animals with five claws. "They traverse the rock in directions either up or down, and not across the surface of the strata, which are now inclined at an angle of 38°. On one slate there are twenty-four continuous impressions of feet, forming a regular track, with six distinct impressions of each foot, the fore foot being differently shaped from the hind foot; the marks of claws are also very distinct[6]." These tracks are supposed

[6] Bridgewater Treatise, vol. i. p. 261.

to have been made by animals of the tortoise species.

Fossil footsteps of even a more striking character, were subsequently discovered in some quarries in Saxony, which are in the same geological strata as the New Red Sandstone of Scotland. The following account of them has been collected from notices by Dr. Hohnbaum and Professor Kemp. "The impressions of feet are partly hollow and partly in relief; all the depressions are upon the *upper* surfaces of slabs of sandstone, whilst the reliefs are only upon the *lower* surfaces, covering those which bear the depressions. These reliefs are natural casts, formed upon the subjunct footsteps as in moulds. On one slab, six feet long by five feet wide, there occur many footsteps of more than one animal, and of various sizes. The larger impressions, which seem to be of the hind foot, are eight inches long, and five wide. One was twelve inches long. Near to each large footstep, and at the regular distance of a foot and a half before it, is the smaller print of a fore foot, four inches long and three inches wide. These footsteps follow one another in pairs, at intervals of fourteen inches from pair to pair, each pair being in the same line. Both large and small steps have the great toes alternately on the right and left side; each has the print of five toes, and

the first, or great toe is bent inward like a thumb. The fore and hind foot are nearly similar in form, though they differ so greatly in size. On the same slab are other tracks, of smaller and different shaped feet, armed with nails. Many of these resemble the impressions on the sandstones of Dumfries, and are apparently the steps of Tortoises[7]."

But of still more importance, as regards the object of our inquiries, is the discovery by Professor Hitchcock of Ornithicnites, or the footprints of various species of birds in the New Red Sandstone of the valley of Connecticut in America. These tracks have been found at various depths beneath the actual surface, in quarries of laminated flagstones. "Seven of these tracks occur in three or four quarries within the space of a few rods square; they are so distinct that the Professor considers them to have been made by as many different species, if not genera of birds. The footsteps appear in regular succession, in the continuous track of an animal in the act of walking or running, with the right and left foot always in their relative places. The distance of the intervals between each footstep in the same track is occasionally varied, but to no greater amount

[7] Bridgewater Treatise, vol. i. p. 264.

than may be explained by the bird having altered its pace. Many tracks of different individuals and different species are often found crossing each other; they are sometimes crowded like impressions of feet on the muddy shores of a stream or pond, where ducks and geese resort[8]."

These footsteps resemble those of Grallæ (Waders), or birds of similar habits; the foot of the largest of these birds measured fifteen inches in length, exclusive of the largest claw, which measured two inches. The toes were broad and thick. The distance between the footsteps are from four to six feet, indicating that the length of the leg must have been about seven feet. From these features it has been calculated that this gigantic biped must have been double the size of an ostrich, the largest of our now existing birds, the foot of which is but ten inches, and the length of the leg four feet, and which is nine feet in height, and in weight exceeds one hundred pounds. Next in size are the footsteps of another bird, whose toes were more slender, and measuring in length fifteen or sixteen inches, exclusive of an appendage measuring back from the heel eight or nine inches, intended to support a heavy animal walking on a soft bottom. The length of the stride was six feet. It thus appears that the earliest forms of

[8] Bridgewater Treatise, vol. ii. p. 39.

the feathered tribe (and the same observation we shall find applicable to the early Reptiles and Mammals) attained a size far exceeding that of any of the same class which now inhabit the earth: as observed by Hugh Miller, "in the imposing programme of creation it was arranged, as a general rule, that in each of the great divisions of the procession, the magnates should walk first."

"This evidence of footsteps, on which we are here arguing, is one which all mankind appeal to in every condition of society. The thief is identified by the impression which his shoe has left near the scene of his depredations. Captain Parry found the tracks of human feet upon the banks of the stream in Possession Bay, which appeared so fresh, that he at first imagined them to have been recently made by some natives: on examination they were distinctly ascertained to be the marks of the shoes of some of his own crew, eleven months before. The frozen condition of the soil had prevented their obliteration. The American savage not only identifies the elk and bison by the impression of their hoofs, but ascertains also the time that has elapsed since each animal had passed. From the camel's track upon the sand the Arab can determine whether it was heavily or lightly laden, or whether it was lame[9]."

[9] Bridgewater Treatise, vol. i. p. 262.

Independent of the interest which naturally attaches to testimony of this nature, these traces of birds in the New Red Sandstone of the Permian system are of peculiar importance, as the first evidence we have of the existence of this class of the created beings. But though their existence at this period is thus established, no fossil remains of them are to be found in this formation, nor until we arrive at the Chalk system, in which some of their bones have been discovered. This evidence, though scanty and faint as to particulars, is nevertheless satisfactory and conclusive, to the extent, that this era witnessed an important step in the animal creation by the addition of Saurian Reptiles and Birds. Of the former, the organic remains are so abundant and well defined in the next succeeding system, that we shall find no difficulty in delineating their natures and habits in the minutest particulars, so as to bring them before us as they lived and moved in the long period of the world's history that witnessed their reign as monarchs of the creation, the highest class of the creatures that God had then made.

THE TRIAS AND OOLITE SYSTEM.

The Permian system, which we have been considering, is the close of what has been termed

by geologists the Primary or Palæozoic formation, and we now enter on what is known as the Secondary or Mesozoic formation, which commenced with the Trias and Oolite system. The Trias is a deposit of shelly limestone resting on the Permian, and known on the Continent by the name of the Muschelkalk. The Oolite, which lies on it, is also a series of calcareous or limestone beds, the principal of which are composed of a conglomerate, or collection of small round grains or spheroids, which resemble a cluster of small eggs, or the roe of a fish. Hence the name—ωον, an egg, λιθος, a stone. The Lias and Wealden, argillaceous limestones, and well developed in many parts of England, are members of the Oolite; the former at the bottom, and the latter at the top, of the system.

This system is extremely abundant in organic remains, which present us with the forms of the then existing animals of a novel and striking description. These are, for the most part, of the genus Saurian Reptile; which, as we have already seen, made their first appearance in the Permian system, but only attained their full dimensions in number, size, and structure, in this formation, when they enter upon the scene in such multitudes, and so gigantic in their proportions, that it has been termed, "*The Age of Reptiles.*"

Of the Batrachian, which, being the development of a fish (the tadpole), is not classed by naturalists with the true Reptile, some species have been found in the Oolite of extraordinary dimensions, as appears from their organic remains, and their footprints on the rocks. One species of these gigantic frogs must have equalled a large hog in size. But the fossil remains of the Saurians are still more remarkable, and present almost incredible combinations of form and structure; and from the extraordinary profusion of their organic remains, it is manifest that the seas and shores of the Oolite world must have literally swarmed with these formidable tyrants of the then animal kingdom. They are divisible into three well-defined and distinct classes—the Enaliosauria, or *Marine Saurians*; the Dinosauria, or *Terrestrial Saurians*; and the Pterosauria, or *Winged Saurians*.

Of the *Marine Saurians*, the principal are the Icthyosaurus and the Plesiosaurus. The Icthyosaurus, of which there are many species of various form and structure, was an amphibious animal of enormous dimensions, often exceeding thirty feet in length, with a head and teeth resembling those of a crocodile, and eyes as large as a man's head. The peculiar shape of its sternum, or breast-bone, formed like that of the duck-rat of Australia, is

conclusive, in the opinion of naturalists, that its nature was such that a continual ascent to the surface to breathe air was necessary to its existence. It was furnished with a huge voracious stomach, and four fins, like the paddles of a whale. The half-digested remains of fishes and other reptiles which have been found in the stomachs of some of them, and the fœcal remains, commonly called coprolites, attest their ferocious and carnivorous habits: and from the strength of its frame, the keenness of its vision, and the propelling force of its paddles, the Icthyosaurus must have been most formidable and destructive to its contemporaries of the ancient deeps.

The Plesiosaurus was a companion of the Icthyosaurus. It is of this creature that *Cuvier* has asserted, that the structure is the most heteroclite, and its character altogether the most anomalous and monstrous that have been yet found among the ruins of a former world. "To the head of a lizard, it united the teeth of a crocodile, a neck of enormous length, resembling the body of a serpent: a trunk and tail having the proportions of an ordinary quadruped, the ribs of a chameleon, and the paddles of a whale [10]." It was manifestly, like the Icthyosaurus, an air-breathing or amphi-

[10] Bridgewater Treatise, vol. i. p. 203.

bious animal; and it has been conjectured by naturalists, that it generally swam upon or near the surface of the water, arching back its long neck like a swan, and plunging it downwards at the fishes which happened to pass within its reach, or seizing birds on the wing above it. Several species have been already discovered, some of them attaining the length of eighteen feet. There are many other species of Marine Saurians besides the foregoing—among others, the Cetiosaurus and the Teleosaurus.

Of the *Terrestrial Saurians* there are many genera; but the principal are the Megalosaurus and Iguanodon, a short description of which will be sufficient to illustrate the whole class. From the organic remains of the Megalosaurus, we collect that it must have been a reptile of large and formidable dimensions, measuring from forty to fifty feet in length, and similar in structure and habits to the Crocodile and Monitor of the present day. From the form of the leg and foot we know that it was a land animal, but adapted also to aquatic habits. The structure of its teeth prove it to have been highly carnivorous and destructive.

The Iguanodon was a contemporary of the Saurians which we have been describing; and though much more gigantic than the Megalosau-

rus, it appears, from the character of its teeth, to have been herbivorous only, and therefore comparatively innocent in its nature and habits. The fossil remains prove that it was similar in structure to the Iguanas of our own times, though of far greater dimensions; for while the Iguana rarely exceeds five feet in length, we know from the organic remains of the Iguanodon, that it attained a length of sixty or seventy feet from its snout to the extremity of its tail. The Hylæosaurus and Steneosaurus also belong to this class of Saurians.

We come now to the *Winged Saurians*, or Pterodactyles, which belong to this period, and which differ from both the Marine and Terrestrial Saurians in a very material particular; for while the latter were confined to sea and land, the Pterodactyle was provided with wings, by means of which it could soar through the air. In external form, this Saurian resembled a gigantic bat or vampire. But they cannot be classified with the bird, inasmuch as their beaks are armed with teeth like those of reptiles—and from this peculiarity, they must, according to Cuvier, be ranged in the class of Saurians or Lizards. Eight or ten species of this creature have been discovered, varying in size from a snipe to a cormorant. "Most of them had the nose elongated, like the snout of a crocodile, and armed with conical teeth.

Their eyes were of enormous size, enabling them to fly by night. From their wings projected fingers, terminated by long hooks, like the curved claw in the thumb of a bat. These must have formed a powerful paw, wherewith the animal was enabled to creep, or climb, or suspend itself from trees. It is probable also that the Pterodactyles had the power of swimming, which is so common to Reptiles[1]."

Besides the foregoing, there is another class of Reptiles, whose remains attest them to have been contemporaneous with the Saurians, viz. *Chelonians or Tortoises.* Their footsteps are found in the New Red Sandstone; and their organic remains justify the inference, that in some countries the carapace or external shell was about twenty feet in length—thus showing that the whole race of the first-created Reptiles were as gigantic in stature, as they were varied in structure and vast in number.

Truly might this be termed "the Age of Reptiles." Great was the army of "the creeping things"—the giant Lizards—in the day of their power. Monarchs and tyrants over all God's then existing creatures, they divided the kingdom among them. Some held dominion over the

[1] Bridgewater Treatise, vol. i. p. 224.

spreading plains and deep forests—some swayed the sceptre of the aërial regions—while others ruled in the oceans, streams, and lakes of the Oolite world with unresisted might.

"Leviathan
And his unwieldy crew, in dreadful sport,
Tempest the loosened brine."

This great abundance of the Reptile race appears, for the first time, in the Lias formation, the lowest member of the Oolite system, though they continue throughout the whole of it, and into the Chalk. But in the Stonesfield Slate, which is a member of the Upper strata of the Oolite, and deposited long subsequent to the Lias, some fossil remains of a small insectivorous animal of the Marsupial family have been found. These Marsupials are considered by naturalists to be a link between the oviparous Reptile and the viviparous Mammal. The Reptile produces its young through the medium of eggs; the Mammal by uterine gestation, nourishing them in the early stages of existence with milk furnished by the mammæ or milk glands; while the Marsupial (of which class are the Kangaroo and Opossum) carries its young, after a brief gestation, in a pouch, where they remain suspended by the mouth to a nipple, until sufficiently matured to come forth to the external air. From this peculiarity, and the inferior con-

dition of the brain, Dr. Buckland infers, "that this order of animal holds an intermediate place between the viviparous and oviparous animals, forming as it were a link between Mammals and Reptiles." The Marsupial, therefore, holds the same position with respect to the Mammal, that the Batrachian holds with respect to the true Reptile—the one being a link between the Fish and the Reptile, and the other between the Reptile and the Mammal. And as the Batrachian made its appearance in the Carboniferous era, which preceded "the Age of Reptiles," so the Marsupial will be found to precede "the age of the Mammals," and may be considered as the herald of the advent of that higher order of the creation which is about to make its appearance in the Tertiary formation.

THE CRETACEOUS SYSTEM.

We now arrive at the uppermost and last bed of the Secondary period—the Chalk, or Cretaceous system, which was formed by deposit in deep seas. The tracts, therefore, which it occupies constituted, at the time of the formation, the bottom of these seas. It has been satisfactorily established by microscopic investigations, that a large proportion of the substance of the Chalk is composed of organic matter, calcareous and silicious shells of animals and sea plants, of such inconceivable mi-

nuteness, that a cubic inch would contain above ten millions of them. Some of these microscopic creatures are still to be found alive in various parts of the globe, Infusoria and Polythalamia. The organic remains of this system are almost entirely marine, consisting of Zoophytes, Mollusks, Crustaceans, Fishes, and Reptiles. The Marine Saurians disappear in this formation, and there is apparently a great diminution of the multitudinous Terrestrial Reptiles of the Oolite system. Fossil remains of Birds have also been here discovered for the first time, though their footprints in the New Red Sandstone announced their existence as far back as the Permian system. Here the secondary or Mesozoic period closes; and we now approach the Tertiary, which brings us comparatively nearer to our own times, and to the species of animals and vegetation which are the contemporaries and associates of the human race.

THE TERTIARY SYSTEM.

The Chalk formations were deposited in seas of considerable extent and great depth; but the formations above the Chalk are comparatively limited in extent, being deposits in the hollows of the Chalk beds, which were estuaries and gulfs left at the close of the Cretaceous period. These are denominated the Tertiary formations, and are

composed of clay, limestone, marl, sand, and gravel, in which we find organic remains of the animals which occupied the surface of the globe during this era, or, more properly speaking, succession of eras. Among other places, the cities of London, Paris, and Brussels have been erected upon basins of these formations; and the contents of these basins and of other similar deposits, which have been brought to light by the labours of the geologist, aided by the ingenuity and skill of the comparative anatomist, show us that the highest order of quadruped Mammals, or Mammifers, had been abundantly brought into existence, *for the first time*, during the Tertiary e och.

We are now approaching the geology and zoology of the earth as it exists in our own times; and it is with relation to this circumstance, that the Tertiary system has been divided into three eras, viz. The Eocene, or *Lower Tertiary*—The Meiocene, or *Middle Tertiary*—and the Pleiocene, or *Upper Tertiary*. To these a fourth is sometimes added, the Pleistocene, or the superficial deposits. The first of these, which represents the lowest layer of deposit, has been denominated the Eocene, as being the dawn of the now existing, or recent races of animals, the contemporaries of the human race—(ηως, dawn, καινος, recent). The next division has been termed the Meiocene, be-

cause it is a less recent series of strata, and contains the fossil remains of less recent classes of animals (μειων, less) than the Pleiocene, which comes next, and whose name indicates a still more recent period (πλειων, more). And the Pleistocene is so termed, because it is the most recent, approaching the existing state of nature (πλειστον, most).

In *the Eocene, or Lower Tertiary*, we find the organic remains of an immense number of quadruped Mammifers, many of them belonging to genera now extinct, in the order of Pachydermata, such as the Palæotherium, an animal described as intermediate between, or partaking of the different characters of, the Rhinoceros, the Horse, and the Tapir; the Anaplotherium, of which there were several species, and whose organic remains show that they varied in size from a Hare to an Ass, the latter of which it resembled in form, though evidently of aquatic habits; the Cheiropotamus, which resembled a Peccary; and the Adapis, a gigantic Hedgehog.

The Meiocene, or Middle Tertiary, in addition to the foregoing, presents us with the earliest forms of some genera which exist at the present day. In this deposit, we find the remains of the extinct Dinotherium Giganteum, a huge herbivorous animal, which is calculated to have been eighteen feet

in length, and was the largest of all the terrestrial Mammifers yet discovered. This creature was of the Mole species, furnished with organs adapted for grubbing below the surface of the ground, or for tearing up roots and plants on the land, or at the bottom of the water. It had two enormously long tusks, projecting downwards from the lower jaw, like those of the Walrus, with which, it is conjectured, it attached itself to the banks of rivers or estuaries, while its body was floating.

In the Pleiocene, we are presented with Mammifers of such vast dimensions, that the period has been termed, "the epoch of gigantic Mammalia;" and according to Dr. Buckland, "it appears that at this epoch, the whole surface of Europe was densely peopled by various orders of Mammalia; that the members of the Herbivora were maintained in due proportion by the controlling influence of the Carnivora; and that the individuals of every species were constructed in a manner fitting to its own enjoyment of the pleasures of existence, and placing it in due and useful relations to the animal and vegetable kingdoms by which it was surrounded[2]." Here it is that we find the organic remains of these huge members of the Elephantoid family, the Mammoth, Mastodon, Megalonyx, and

[2] Bridgewater Treatise, vol. i. p. 95.

Megatherium, all of them of truly colossal dimensions, but now represented by animals of comparatively inferior size and strength, such as the Elephant, the Rhinoceros, the Hippopotamus, and the Sloth. The dimensions of the Mastodon may be conjectured, when we state that the lower jaw of a skeleton of one of those which was found in the Hudson, is two feet ten inches in length, and weighs sixty-three pounds. The Megatherium was an animal of the Sloth species. The following graphic description will introduce him to the reader: "With the head and shoulders of a Sloth, it combined, in its legs and feet, an admixture of the characters of the Ant Eater, the Armadillo, and the Clamyphorus; it probably also still further resembled the Armadillo and Clamyphorus, in being cased with a bony coat of armour. Its haunches were more than five feet wide, and its body twelve feet long and eight feet high; its feet were a yard in length, and terminated by most gigantic claws; its tail was probably clad in armour, and much larger than the tail of any other beast among extinct or living terrestrial Mammalia[3]." The Megalonyx was also of the Sloth tribe, herbivorous in its nature, but of smaller dimensions than the Megatherium. The Mammoth,

[3] Bridgewater Treatise, vol. i. p. 163.

which appears to have been the most recent of these colossal tribes, approaching nearer to the human era than any of the others, was a species of Elephant adapted to live in a cold climate, as appears from the remains which have been found in abundance in the Arctic regions; more especially from a specimen which was discovered in Siberia in 1801, imbedded in a mass of ice, which had preserved, not only the flesh and hide, but a great quantity of the red woolly hair with which the animal had been covered.

Besides the foregoing, there are vast numbers of species of other animals—some of them extinct, and some still existing, such as tigers, bears, and hyenas—the skeletons of which have been found in abundance in the caverns and fissures of rocks, and which, from the surrounding conditions and circumstances, obviously preceded the existence of the human race.

The Tertiary, therefore, is the era of the quadruped Mammals—next to Man, the highest in the order of the animal creation—and no remains of which are to be found in any of the preceding formations, with the exception perhaps of the small semi-reptile Marsupials of the Oolite, which formed a connecting link between them and the pre-existent Saurians. Many of the genera and species of these Mammifers are extinct; the remainder

are the contemporaries of the human race. But Man has not yet appeared :—

> "There wanted yet the master work, the end
> Of all yet done ; a creature, who, not prone
> And brute as other creatures, but endued
> With sanctity of reason, might erect
> His stature, and upright with front serene
> Govern the rest, self-knowing."

No fact, in the whole range of geological phenomena, is better established than this, that all classes and orders of created beings below the rank of Man, with which the earth is furnished, were in existence when Man was not.

> "Air, water, earth
> By fowl, fish, beast, was flown, was swam, was walked
> Frequent."

All the host of them, from the Zoophyte to the quadruped Mammifer, from the Fucoid to the Forest Tree, lived and moved, enriched and beautified the face of our planet, untold ages before we come to the Alluvium, or superficial accumulations, in which alone are to be found any remains or vestiges of the human race, either their bones or any article of their fabrication.

Nor can the absence of these testimonials of Man's existence be ascribed to any peculiarity of structure or circumstances of life ; for it has been

well observed by Sir Charles Lyell, that "no inhabitant of the land exposes himself to so many dangers on the waters as man, whether in a savage or a civilized state; and there is no animal, therefore, whose skeleton is so liable to become imbedded in limestone or submarine deposits: nor can it be said that his remains are more perishable than those of other animals; for in ancient fields of battle, as Cuvier has observed, the bones of men have suffered as little decomposition as those of horses which were buried in the same grave. But even if the more solid parts of our species had disappeared, the impression of their forms would have remained engraven on the rocks, as have the traces of the tenderest leaves of plants, and the soft integuments of many animals. Works of art moreover, composed of the most indestructible materials, would have outlasted almost all the organic contents of sedimentary rocks. Edifices and even entire cities have, within the times of history, been buried under volcanic ejections, submerged beneath the sea, or engulphed by earthquakes; and had these catastrophes been repeated through an indefinite lapse of ages, the high antiquity of man would have been inscribed in far more legible characters on the framework of the globe, than in the forms of the ancient vegetation which once covered the islands of the Northern Ocean, or of those gigantic

reptiles which, at a still later period, peopled the seas and rivers of the northern hemisphere[4]."

Man, then, was the last item of the work of the creation. It is so written in Scripture, and Geology has indorsed the Record as true. A position of such importance to the cause of Bible inspiration has not escaped the repeated assaults of the sceptic; and it has, therefore, been asserted, from time to time, that the fossil remains of the human race have been discovered in strata that prove his existence in some one or other of the older formations. But the attack has always been defeated, either by the skill of the anatomist, proving that the organic remains are those of some inferior animal; or by the geologist, showing that the place of deposit was in some of the accumulations of silt, sand, or mud, which belong to the modern era. Thus the fossil remains from the sub-apennine of Œningen, which were described by Scheuchtzer as the skeleton of a man, in a work entitled "*Homo diluvii testis*," were proved by Cuvier, beyond all doubt, to be the fossil remains of an extinct Salamander; and the stony human skeleton which is to be seen in the British Museum, was found, with many others, imbedded in the limestone of Guadaloupe, which is plainly and admittedly a

[4] Lyell's Principles of Geology, p. 147.

recent deposit, formed by the action of the atmosphere, and streams impregnated with carbonate of lime, or the detritus of coral reefs which surrounded the island.

THE ERA OF SUPERFICIAL DEPOSITS.

We have now, accompanying Time on its slow and stately march, attained the top of the stratified deposits—the platform on which rests the Alluvium which is occupied by the present races of men, animals, and plants; but Geology has furnished us with many facts which prove, that a very considerable period of time must have intervened between the formation of this platform and the creation of man. This period has been termed the Era of Superficial Deposits, during which those accumulations of gravel, clay, sand, marl, peat, coral reefs, &c., which present themselves to the eye all over the surface of the earth, have been formed; and we have reason to know, that, since the commencement of this epoch, great portions of the continent of Europe, and of our own islands, have been submerged and become the bottoms of seas, while, on the other hand, what had formed the beds of seas, lakes, and rivers, have been, in many instances, elevated, and now form portions of our dry land.

The surfaces of our continents and islands present us with abundance of evidence of such sub-

mergence, and that mighty currents have, since the formation of the Tertiary strata, swept across the face of extensive districts of the present dry land, scooping out deep valleys through the sedimentary rocks, and bearing along with them from great distances huge masses of rocks and boulder stones, supposed to have been imbedded in, and transported with, blocks of ice. Again, beds of now existing species of shells are found in some places, hundreds of feet above the level of the ocean, which could not have originated in any other way than by submergence and subsequent elevation, which must have occupied vast periods of time.

But we have a still more striking evidence of the length of time that must have elapsed since our continents and islands assumed their present configurations, in the denudations and erosions which have taken place in the earth's surface above the Tertiary formations. Rocks bordering upon the sea-coast have been worn away by the slow action of the ocean considerable distances, in some places nearly two miles; while rivers have gradually excavated deep channels or gorges; and waterfalls have eaten down the rocks over which their torrents have been pouring for ages, and have thereby retreated to the distance of many miles from their original position. The far-famed falls of Niagara, in North America, are an instance

of the effect of this eroding power of flowing water on its rocky bed. It is plain to the observer that the river originally flowed in a valley across the whole platform (but some feet higher), from the present site of the falls to Queenstown Heights, where the cataract was, to all appearance, originally situated; and that the river has eaten its way backwards through hard strata of Silurian rocks for a distance of seven miles. Sir Charles Lyell has calculated, from accurate observation and close study of the nature of the rocks and the strength of the eroding power, that 35,000 years, at the least, would have been required for the retreat which the falls have made by erosion in the manner described.

Professor Hitchcock supplies us with several other instances, in his own country, of what has been effected by erosions of this description. He observes, "The Niagara gorge is only one among a multitude of examples which might be quoted; and some of them far more striking to a geologist. On Oak Orchard Creek and the Genesee River, between Rochester and Lake Ontario, are similar erosions, seven miles long. On the latter river, south of Rochester, we find a cut from Mount Morris to Portage, sometimes 400 feet deep. On many of our south-western rivers we have what are called caverns or gorges, often 250 feet

deep, and several miles long. Near the source of the Missouri River are what are called the Rocky Mountains, where there is a gorge six miles long, and 1200 feet deep. Similar cuts occur in the Colombia River, hundreds of feet deep, through the hard trap rock, for hundreds of miles, between the American Falls and the Dalles. At St. Anthony's Falls, in the Mississippi, that river has worn a passage in limestone seven miles long, which distance the cataract has receded. On the Potomac, ten miles west of Washington, the Great Falls have worn back a passage sixty to sixty-five feet deep, four miles continuously; a greater work, considering the nature of the rock, than has been done by the Niagara. The passage for the Hudson through the Highlands is probably an example of river erosion, as is also that of the Connecticut at Battleboro' and Bellow's Fall. In these places, it can be proved that the river was once at least 700 feet above its present bed. On the Deerfield River, a tributary of the Connecticut, we have a gulf called the Ghor, eight miles long, and several hundred feet deep, cut crosswise through the Mica slate and Gneiss by the stream[5]." The Professor mentions many other analogous cases in different parts of the world, more espe-

[5] The Religion of Geology, pp. 59, 60.

cially in Eastern climes, all of them evidencing that mighty periods of time must have elapsed since the commencement of our present geographical distribution of land and sea; during which these stupendous effects were produced by the slow and gradual processes which we have been describing. Take this period at the lowest limit, and it must have commenced at a time incalculably more distant than what we have reason to know, even independently of Revelation, to have been the dawn of the human era.

But, though long the period which intervened between the formation of the Tertiary deposits and the human era, it is of importance to remark that the researches of the geologist have proved, beyond doubt, that there has been no interruption in the animal or vegetable creation. Not only has there been no such blank as would require a resort to the theory of a *new creation*, to account for the present existence of an animal and vegetable world, but it is plain that many of the species which existed during the Tertiary formation exist at the present day. Nothing is better established than that the specific forms of many of the now existing terrestrial animals, shells, and plants, are identical with those of the Tertiary period, while others differ so slightly that they may be considered as substantially the same. For in-

stance, the badger of the Meiocene is the same animal in all respects as the badger of our own times; and the same may be said of many other animals, such as the goat, the fox, and the wild cat. We know also, that many of the now existing reptiles were the contemporaries of extinct Tertiary quadrupeds in India. Again, immense numbers of the shells of Mollusks now inhabiting our seas, are found in positions that prove the existence of the species to have been long prior to that of the human race; and in the same way, many of the trees and plants which now fill our forests, and clothe our plains and hills with their verdure, have been discovered in the Tertiary formations, far below the level of the Alluvium in which are found the first indications of Man and his works.

Going back to the earliest geological ages—to the first moment of physical life upon our planet—the evidence is distinct, that some of the species of each system have lived contemporaneously with some of those of the succeeding systems. For instance, we find the fossil remains of some of the Zoophytes, Mollusks, and Crustaceans, the first tenants of the Silurian ocean, associated in the next strata with those of the Fish of the Devonian, while the latter have been found mingled with the exuviæ of the Reptiles of the Permian,

Lias, and Oolite; and animals of those systems are found to have lived contemporaneously with the Mammals of the Tertiaries; and, again, some of those Mammals are found, as we have already stated, in existence to the present hour. These facts establish the proposition, *that no blank or break of continuity has hitherto occurred in the animal kingdom from the beginning*; and that there is nothing to favour the hypothesis, that there has been, at any time, a death of existing races, and a new birth of those which followed. On the contrary, all the facts of Geology prove that such an event has never occurred.

This will be found of importance, when we come to the consideration of the theory on which Dr. Chalmers, and other eminent Christian inquirers, have built their arguments to prove the consistency of Geology and Scripture. Their systems of interpretation require that life must have been blotted out, and a new series of organic beings have commenced their existence, at the date of the human era. But geological facts have taught us, in a language not to be mistaken, that since life was first poured out upon our planet, it has never ceased to flow, without interruption, through the various species of those organic forms which God ordained to be the receptacles of the vitalities in and through which his power, wisdom,

and goodness have been disclosed to men and angels. And though the globe on which we dwell has experienced great vicissitudes, and has from time to time been the scene of vast elementary convulsions, it has never been reduced to such a state of lifeless elementary turmoil, as that which is known from Geology to have preceded the Silurian era. Geological history, which communicates the undoubted fact of the surface of our planet having been dark and untenanted, "without form and void," down to the close of the *Azoic* age, furnishes us with evidence equally satisfactory, that the Almighty has never blotted out or withdrawn his gifts of light and life, so as to necessitate the exercise of a creative power, similar to that which first called them into marvellous being, to account for their present existence.

CHAPTER III.

THE MOSAIC RECORD OF THE CREATION.

"So reads he Nature, whom the lamp of truth
Illuminates. Thy lamp, mysterious Word."—COWPER.

THE Record of the Rocks is now before us; and on its stony pages we have traced the actual progress of the creation of the various races of animals and plants, which have occupied our planet from "the beginning." We have ascended from the era of the lowly Zoophyte, groping in the mud and darkness of the primeval ocean, up to that of lordly Man, surrounded with all the glories and beauties of animated nature, and endowed with an intellect wherewith to understand and appreciate them. We are now in a position to test the accuracy of the written Record—but before we open it, let us pause for a moment to survey the wondrous scene of the creation, which our examination of the Book of Nature has been unfolding to our view.

The first glimpse of our planet presents us with

a revolving mass of igneous fluid, wheeling its annual course around the Solar centre of the system, and gradually cooling down by radiation into space, whereby a granitic crust is formed upon the surface. The gases and vapours, capable of producing water and air, thus condensing, the globe becomes enveloped, first with its aqueous, and then with its aërial garment. The whirling mass, encircled with water, expanding into vapours by the still existing central heat, exhibits a chaotic turmoil of gaseous exhalations, and liquid and muddy ejections from beneath, which, mingled with the detritus and abrasions of the primordial granite, form a thick sediment, that, gradually subsiding on the crust below, deposits the first layer of sedimentary rocks. From the circumstance of no fossil remains having been discovered in those bottom rocks, we are warranted in our conclusion, that at this period of its history, *no life existed on the globe.* This is succeeded by another aqueous deposit, in which the first specimens of organic life make their appearance in the humble forms of Fucoids, Zoophytes, Mollusks, and Crustaceans; the latter being the highest form of animal organization during the long period occupied by the formation of the Silurian system of rocks. We are then presented with the next succeeding strata (the Devonian), in which we find

a progress of creation in the appearance of Vertebrate Fishes and Land Plants, which are ushered into existence with a burst of volcanic disturbances, by which a great proportion of our vast mountain chains were thrown up above the expanse of the waters, and present the first tract of dry land. To these succeeded the Carboniferous era, with its remarkable coal measures, attesting an exuberant and gigantic land vegetation; the profusion and extent of which required a prolonged and uninterrupted continuance of *shade, heat, and moisture*, for the production of the peculiar races of plants of which the mineral mass is principally composed. The Permian and Oolite strata succeed, disclosing a diminution of vegetation, and a great abundance of the family of air-breathing Reptiles, which in that era swarmed forth from the waters of the Earth—the huge Icthyosaurus, Plesiosaurus, and the other vast *Marine Saurians*—the Megalosaurus, Iguanodon, and other members of the *Terrestrial Saurians*—the various species of the Pterodactyles, or *Winged Saurians*—and the varieties of the feathered tribe, which have left their footprints in the petrified mud and sand of the ancient shores, which at this period they frequented. Then follow the formations in which we discern the organic remains of the earliest terrestrial quadruped Mammifers which

trod the earth, from the lowly organized Marsupial to the gigantic Megatheria, Mastodons, and Mammoths, that filled the forests, and spread themselves over the plains of the Tertiary formations. To these succeeded the era of Superficial Accumulations, which present no new creations, until we arrive at the topmost coating of Alluvium, the abode of the human race with their associated animals and plants; where, for the first time, is discovered the evidence of Man's existence, the last and crowning work and masterpiece of Creation.

We now open the written Record—the Scripture summary of the events of a creation, which occurred during some portion, at all events, of the long period whose history we have been exploring, comprised between the creation of the material heaven and earth and that of the human race. This narrative occupies the first page of the Revelation to Man of the high destiny which awaits him, and the means by which his title thereto is to be perfected; and without which, he has no further assurance of an existence beyond the grave than the beasts that perish.

With what trembling awe ought we then to open this Book, for the purpose of comparing its first page with the unerring disclosures of the

Book of Nature, which we have been tracing through an undefined series of ages, to which the era of man is as the rain-drop to the copious shower—it may be, to the ocean itself! If it bears not the test of comparison—if it speaks a different language, or conveys, as a truth, one fact that is disproved by the writing on the Rocks, sad is the fate of man! With the first page of his title to life and immortality dishonoured and blotted out, what is his claim to any thing in nature's wide expanse, but the brief and troublous space that lies between the cradle and the tomb? The triumph of the sceptic is complete; for his doubts, difficulties, and denials prove that there is no such thing as an instinctive knowledge of immortality; and experience, without revelation, teaches nothing but death without awaking. But, blessed be God, the secrets bound up in the Earth, hidden from the sight and knowledge of Moses, and unknown to succeeding generations for thousands of years, have at last come forth into the light of day, not to refute, but to bear witness to his truth and inspiration.

The Mosaic narrative is a detail of the progress of a creation, commenced and completed in the course of what, in Scripture phraseology, is termed six days. The first and preliminary point

to be settled before we can approach the interpretation, is the meaning to be attributed to the word "day." It may be used to denote, either a natural day, or a period of time comprising many natural days and nights; and we have it employed in the Bible and elsewhere to convey the latter in some, and the former in other, passages of the same writings. It is, in point of fact, an ordinary mode of expressing indefinite periods of duration in all languages; and Professor Hitchcock has remarked, that even in the latter books of the Bible, when the Hebrew language was much more cultivated, the Jews had no other word to express periods of time. We conceive that, in the Bible narrative of the creation, the term is intended to denote the larger period; and it will be a sufficient justification for our use of it in this extended sense, that we find it similarly employed in this same narrative of the creation, viz. in the fourth verse of the second chapter, "These are the generations of the heavens and of the earth when they were created, *in the day that the Lord God made the earth and the heavens*," &c. In the Book of Job the period of man's life is termed "his day [1]." In other parts of Scripture we have similar expressions, such as, "the *day* of God's wrath," "the *day* of the Lord;" and in the prophecies of Zecha-

[1] Job xiv. 6.

riah, "the day of the Lord" is described as "*one day* which shall be known to the Lord, not day, nor night; but it shall come to pass, that at *evening time* it shall be light[2]." An indefinite period is here denoted, and it is described as having, like the "day" in Genesis, an evening. Again, the prophet Daniel describes as "the vision of the evening and morning," a period previously described to him as comprising "two thousand and three hundred days." To these, many other instances of the word being used in the extended sense might be added from the Pentateuch[3]. In the prophetical books the instances are still more frequent.

There is another view of this question which may tend to elucidate the meaning and import of the Mosaic language. The history of the creation was conveyed to Moses, either by direct inspiration, or, like the generality of divine communications, through the medium of a vision, or series of visions; and comparing the expression, "then evening was, then morning was, one day[4]," with the somewhat similar expression in the Book

[2] Zech. xiv. 7.

[3] Exod. x. 6. Lev. vii. 35, 36. Numb. vii. 10. 84. Deut. xii. 8; xxxi. 17, 18. 27.

[4] This is the literal and correct translation of the Hebrew passage, which has been rendered in our version, "the evening and the morning were the first day."

of Daniel, "the vision of the evening and the morning," we cannot but see that there is strong ground for the suggestion, that the whole scene was communicated to the sacred historian in a succession of visions, each separate one occupying an evening and a morning, that is to say, an intermediate night, the season of visions or dreams; and the transactions of it appearing to Moses to be comprised in the compass of a natural day, which is defined to be the period of light, though the realities, of which it was the vision, occupied many natural days and nights. It is well known that the transactions of years are often compressed in a dream into the space of a few minutes, or even a less space of time; on the same principle, the operations of the divine Author of the Creation, which may have occupied a long series of years, may have been presented to Moses as the events of a single day. In like manner, the prophet Daniel beheld in the vision of an evening and a morning, a series of events which, as detailed, could not have occupied more than a few hours, and yet in reality were to occupy two thousand three hundred prophetic days, which have not, in all probability, run out their course even to this hour.

An examination of the structure of the narrative will confirm this view; for we find each part

of it to be, either an announcement of what God had said, or a description of what Moses had seen. All that is communicated by Moses is, either what was uttered in his hearing, or presented to his sight. We have a report of what God commanded, and what was seen to follow the command—the Heavens, the Earth, the Ocean, the Light, the Clouds raised above the atmosphere, Land vegetation, Sun, Moon, and Stars, Reptiles, Birds, Quadruped Mammifers, and Man. All these could have been brought to the senses of Moses in a vision, but what he could not have seen naturally, such as Fishes and other submarine creatures, and Insects, are not, as we shall presently find, mentioned as having been presented to his view, though they undoubtedly formed part of the creation. This construction of the narrative will reconcile the apparent discrepancy between the word "day," which is defined to be a period of light, and the expression, "evening was, and morning was," which necessarily comprises the intervening period of darkness.

Long before the question had assumed the importance which the discoveries of Geology have given to it, some of the best informed philologists advocated the opinion, that the Mosaic days were periods of long duration. Among the Jews, Josephus and Philo; and of Christians, Whiston,

Des Cartes, and De Luc have so expressed themselves; while of those who have written at a later period, with a full knowledge of Geological facts, we have Cuvier, Parkinson, Jameson, and Silliman, and, more recently, Hugh Miller—all of them holding the opinion, that the Mosaic days of creation *are successive periods of long duration*, being used in the first chapter of Genesis in the same sense in which the word "day" is employed in the fourth verse of the second chapter of the same Book; and which is but a continuation of the narrative of the history of the Creation. Moreover, it has been admitted even by some of those who have construed the Mosaic day as a natural day, that "there is no sound critical or theological objection to the interpretation of the word 'day,' as meaning a long period." This observation of Dr. Buckland, one of the able advocates of the natural day sense of the word, may, of itself, be deemed a sufficient justification for our interpreting it as intended to convey a lengthened period of time, until we shall have applied the true test of the propriety of such a construction, viz. the adequacy of the interpretation, of which it will form one of the chief elements, to satisfy all the requirements of Geological facts and discoveries—and further, shown the impossibility of reconciling a creation of six natural days with the same facts and discoveries. But

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before we leave this subject, it will be necessary to notice briefly a plausible objection which has been urged against our view of the meaning of the Mosaic "day."

It has been urged by the advocates for the natural day sense of the term "day," that the fourth Commandment speaks of the Creation as the work of six natural days, otherwise the reason for the sanctification of the Sabbath, as a natural day, is invalidated. But it is obvious to every candid inquirer, that what is intended to be conveyed by the terms of the divine precept is simply, that as God wrought during six successive periods, and rested from his labours on the seventh, so ought man to work in his six natural periods of days, and to rest on the seventh. The distribution of his time ought to be similar to that of the Divine Author of his existence. The allusion to the creation is introduced *by way of illustration or example, and not as conveying a literal truth.* On the other hand, the tenor of this Commandment would appear to furnish a strong argument in favour of the extended sense of the word "day." For, ever since the creation of Man, God has been resting from his work of creation. It has never been recommenced. The seventh day is, therefore, a current period of long duration—something more than a natural day. Consequently, the other

six days must, in consistency, be similarly extended.

We have already alluded to the circumstance, that early in the history of Geology as a science, an apprehension prevailed, that the facts disclosed by it were fatal to the truth of the Mosaic Record, as a narrative of the Creation. It was alleged, that in the Book of Genesis the age of the world and its occupants had been limited to the human era, a period of about six thousand years, while Geology had taught us that the earth and various races of animals and plants had been in existence countless ages before that time. This was the plausible objection of the sceptic; and the first to encounter it was the famous Dr. Chalmers, who propounded, as his fundamental proposition, that "the writings of Moses do not fix the antiquity of the Globe." His scheme of reconciliation of Scripture with the requirements of Geology was, that between the first act of the creation of the Heaven and the Earth, and the creation of Light with all that followed it, a vast and undefined period of time may have intervened, during which all the races of animals and plants, whose organic remains are found in the rocks, had lived and died; and that previous to the creation which is recorded by Moses, the light of the sun had been temporarily obscured, and the then existing animal and vege-

table creation wholly extinguished in a chaos of death and darkness, which had surrounded and overspread the earth—thus rendering it a scene of wreck and ruin, which may have continued for many ages. He then suggests, that the appearance of light at the divine command and the creation recorded by Moses, were realized by a dispersion of this darkness, and a renovation of the Earth by replenishing and refurnishing it with the several races of animals and plants which now adorn its surface—and this work of restoration was completed in a period of six natural days, ending with the creation of Man.

It may be conceded that the language and structure of the Scripture narrative will admit of such a construction; and consequently, if such be the true construction, that, as Dr. Buckland expresses it, "the beginning may have been an epoch at an unmeasured distance, followed by periods of undefined duration, during which all the physical operations disclosed by Geology were going on." It may be, that, consistently with the Mosaic phraseology, "the Earth was" (became), at the close of the epoch, "without form and void," —waste and empty, and involved in darkness; but it is scarcely consistent with the Divine economy declared by his works, that such an obliteration of admittedly long previously existing races of animals

and plants, as this scheme of interpretation necessitates, should have occurred—and that the Almighty should have restored the Earth by creating new races of similar beings in six natural days. That the Almighty could, in his omnipotence, have performed such a work, is certain; but it would ill accord with that consistency and regularity which all sense and experience show to be his distinguishing attributes. If He occupied ages upon ages, as Geology demonstrates to have been the fact, in his construction of a pre-Adamite world of life and order, has the Christian any right to presume that it was blotted out, and another similar world of life and order created in six natural days, without, at all events, an express revelation that such had been the course of events? The Sceptic, with whom this question is to be argued, will not, to uphold the Scripture, admit a doubtful construction of its first passage, which involves the necessity of an extinction of a former world of light and life, and lowers what professes to be a history of the creation to that of a mere miraculous restoration of something that had previously existed, and been for a time blotted out.

Creation is an act of the Deity whereby certain effects are produced; and the divine mode of operation for the production of those results have

been demonstrated to man by the pre-Adamite creation, to have been on a determinate plan, and by certain steps or progressive stages, each of which occupied long periods of time. By the pre-Adamite creation, we mean the creation of those animals and plants whose fossil remains have been preserved in the rocks; and these, we know from Geology, were elaborated through an immensely protracted series of ages, beginning with the lowest forms of physical organization, Fucoids and Zoophytes, and progressing with slow and measured steps up the tract of time through the higher orders, until we arrive at the quadruped Mammifer. The Fucoid and Zoophyte appeared long ages before land vegetation; and land vegetation many ages before Reptiles; and equally long spaces of time intervened between the first appearance of the Reptile and that of the quadruped Mammifer. We also know from the same source, that after the first acts of creation in each class, the succeeding animals and plants were brought on the stage of existence by the same means or processes as the animals and plants which surround us at the present day, viz. by sexual procreation, and germination of seeds.

This was the system, plan, or order of the Divine Creation of an animal and vegetable world, of the same nature, in all material particulars, as that

which now exists—the various species living and growing on the same earth, and moving in the same ocean, as those which now exist, surrounded by the same atmosphere, lightened by the same celestial bodies, and subject to and governed by the same processes of nature—rain, wind, and tides—which prevail at the present day; and yet it is contended, that the animal and vegetable world which now surrounds us, similar in nature and condition to a former one, which, it is alleged, has been blotted out, has been created by Him on a wholly different plan or system, not at the long intervals which marked the pre-Adamite creation, but in the brief span of six natural days. In such a scheme of interpretation of the word and works of the Most High, there is neither religion nor philosophy. God is a God of order. Consistency and regularity are stamped on every particle of his work, and proclaim that such are the distinguishing attributes of the great Architect of the Heavens and the Earth, and of all that therein is. But this interpretation of his word represents Him as one who pursues different plans, at different times, for the production of similar effects; which, being a departure from the previously declared laws of nature, must be ascribed to a miraculous interference of the Deity, without any warrant, object, or necessity for it.

None have more strenuously deprecated the evocation of miracles to explain a doubtful revelation, than those who have upheld these views of Dr. Chalmers. One of the most able of them, Dr. Pye Smith, has well, but without much consistency, observed, that "the Scriptures abundantly show that the Divine Wisdom has not lavished away miracles; but, so far as we know, has wrought them only for the purpose of accrediting the claim of some one who professed to be the bearer of a revelation from God." No reason of that description can be suggested, in this instance, for a violation of the sacred laws of nature, the observance of which attests the power and presence of the Almighty with more conviction to a reflecting mind, than could be effected by any breach or suspension of them.

"To common sense, great Nature's course proclaims
A Deity: when Mankind falls asleep,
A miracle is sent, as an alarm;
To wake the world, and prove *Him* o'er again,
By recent argument, but not more strong.
Say, which imports more plenitude of power,
Or Nature's laws to fix, or to repeal?
To make a sun, or stop his mid career?"

But the position of the learned divine has been encountered and disproved by an argument more formidable, perhaps, and conclusive in its nature, than the foregoing. His interpretation was pro-

pounded at a time when Geology was in its infancy as a science, its facts few, and even those not reduced to the order and arrangement which they now present; but it cannot meet the requirements of the science in its advanced state, by which we have been furnished with a fact established beyond dispute by the researches of the practical geologist, and which is wholly irreconcileable with the foregoing construction of the Mosaic narrative. The fact to which we allude is one which has been stated before, viz. that between the animal and vegetable existences of the primeval or pre-Adamite world, and those of our own era, *no interruption or blank occurs;* but many of the existing species were contemporaneous with some of those that we know to have become extinct long before Man was created. Many of them, instead of coming into existence a few days before that event, were undoubtedly in existence long ages before; and there is, therefore, no room in Nature's course for any such period of obliteration and darkness, as that which the scheme of Dr. Chalmers requires.

This proposition and its consequences are thus stated by Hugh Miller: "It is a great fact, now fully established in the course of geological discovery, that between the plants which, in the present time, cover the earth, and the animals

which inhabit it, and the animals and plants of the later extinct creations, there occurred *no break or blank*, but that, on the contrary, many of the existing organisms were contemporary, during the morning of their being, with many of the extinct ones during the evening of theirs. We know, further, that not a few of the shells which now live on our coasts, and several even of the wild animals which continue to survive amid our tracts of hill and forest, were in existence many ages ere the human age began. Instead of dating their beginning only a single natural day, or at most two natural days, in advance of Man, they must have preceded him by many thousand years. In fine, in consequence of that comparatively recent extension of geologic fact in the direction of the later systems and formations, through which we are led to know that the present creation was not cut off abruptly from the preceding one, but that, on the contrary, it dovetailed into it at a thousand different points, we are led also to know, that any scheme of reconciliation which would separate between the recent and the extinct existences by a chaotic gulf of death and darkness, is a scheme which no longer meets the necessities of the case. Though perfectly adequate forty years ago, it has been greatly outgrown by the progress of geological discovery,

and is, as I have said, adequate no longer; and it becomes a not unimportant matter to determine the special scheme that would bring into completest harmony the course of creation, as now ascertained by the geologist, and that brief but sublime narrative of its progress which forms a meet introduction in Holy Writ to the history of the human family." And after detailing the evidence in support of this position, he subsequently observes, that, "all the evidence runs counter to the supposition, that immediately before the appearance of Man upon earth there existed a chaotic period which separated the previous from the present creation[5]."

To avoid this difficulty, the learned Dr. Pye Smith, while adopting generally the interpretation of Dr. Chalmers, suggested that the chaotic period had been limited and confined to one particular portion of the earth's surface, "the part of the world which God was adapting for the dwelling place of Man, and the animals connected with him." This section of the earth he conceives to have been, "a part of Asia, lying between the Caucasian ridge, the Caspian Sea, and Tartary, on the north, the Persian and Indian Seas on the south, and the mountain ridges which run at con-

[5] The Two Records. A Lecture, pp. 9, 10. 15.

siderable distances, on the eastern and western flanks. . . . This region was first, by atmospheric and geological causes of previous operation under the will of the Almighty, brought into a condition of superficial ruin, or some kind of general disorder[6]."

This scheme of interpretation, if admissible, leaves to the Geologist his unbroken series of animals and plants, except in that small portion of the globe which was the scene of the alleged chaotic visitation, and subsequent restoration. So far it meets the foregoing objection, but it is open to all the other objections alleged against the scheme of Dr. Chalmers, besides many more peculiar to itself, and to which such a narrow view of the revealed plan of the creation is plainly obnoxious. On these we need not dwell; for the construction contended for is obviously inconsistent and irreconcileable with the Scripture language. How read we?—"In the beginning God created the Heaven and THE EARTH." This manifestly and admittedly comprises *the whole globe*. "And THE EARTH was (became) without form and void." How can the same term, "the Earth," in this latter sentence be confined to a part, and a very small part, of the Earth's surface? And yet Dr. Smith's interpretation requires that it should. Even if such a construction be received

[6] Geology and Scripture, pp. 250, 251, 5th ed.

by the indulgent Christian, anxious to preserve unimpeached his greatest earthly treasure, how can it be brought to bear on the Sceptic, whose objections we are bound to answer? He will not permit that different meanings should be assigned to the same word in two consecutive sentences of a communication, which, if divine, must be accurate, without any apparent warrant, or necessity, for such an unusual construction, beyond the necessity arising from the circumstance, that without it his objections must remain unanswered.

But if these interpretations are to be abandoned as no longer tenable, how, it may be asked, are we to uphold in its truth and integrity the Scripture record? To this all-important question, the reply is, that we must return to the simple construction of the Mosaic record, as a narrative of the general plan of the creation from the beginning down to the close of the work—a position, from which those champions of the Bible retreated, but which they would never have thought of abandoning, except under a misapprehension that it was not tenable in their encounter with geological facts. The supposed difficulty, under pressure of which they then retired, and resorted to the interpretations which we have been discussing, is succinctly stated by Dr. Buckland. After observing that it had been asserted that the

order of succession of the organic remains of a former world accords with the order of creation recorded in Genesis, he continues—"This assertion, though to a certain degree apparently correct, is not entirely supported by geological facts; since it appears that the most ancient marine animals occur in the same division of the lowest transition strata with the earliest remains of vegetables; so that the evidence of organic remains, as far as it goes, shows the origin of plants and animals to have been contemporaneous; *if any creation of plants preceded that of animals*, no evidence of such an event has yet been discovered by the researches of Geology[7]." The same difficulty is thus presented by another able and intelligent advocate for the natural day interpretation, "Genesis declares vegetables to have been created on the third day, *and no animals until the fifth*; but we do not find vegetable remains without animal remains in any of the great formations, ancient or modern[8]."

The difficulties thus suggested as hostile to an adherence to what is obviously the natural construction and tenor of the Mosaic narrative, are founded on a misapprehension of the purport of its language. We shall find, as we proceed in our

[7] Bridgewater Treatise, vol. i. p. 17.
[8] Geology and Religion, p. 102.

inquiries, that it is a misconstruction of the words of Moses, to say that "the creation of plants preceded that of animals," as stated by Dr. Buckland; or that "no animals were created until the fifth day," as alleged by Dr. King. On the contrary, we hope to be able to show distinctly, that the order of creation recorded in Genesis is accurately in accordance with the order of the organic remains, both of animals and plants, as disclosed by Geology—that, according to Moses, some animals were created before, some contemporaneous with, and some after the creation of plants; and that this order of creation is confirmed and ratified by the discoveries of the Geologist.

Should these propositions be established, the Christian inquirer will have no difficulty in adopting that reading of the written Record of the Creation, which must recommend itself to every candid and unprejudiced mind, as admitted by one of the foregoing writers, who, but for the difficulty which he has suggested, would have preferred the more simple and obvious construction of the Mosaic narrative which we are advocating. He observes, "The first chapter of Genesis, when explained of the making and peopling of the world at large, has, no doubt, a peculiar fitness and grandeur; and if the language of Scripture and the facts of Science were found to admit of

this interpretation, it would be preferred to others[9]." The language of Scripture and the facts of Science will, we trust, appear, in the following pages, to be not merely reconcileable, *but in perfect harmony and unison;* and that which presented the appearance of discrepancy between them, and veiled the truth from those seeking it, will be shown to have arisen, partly from a misinterpretation of the language of Moses, and partly from a misapprehension of geological facts.

Hugh Miller, in a recent work[1], has adopted the view of the six days being lengthened periods, and not natural days, and has endeavoured, on that hypothesis, to reconcile the Scripture and Geologic records; but he professes that, as a Geologist, he is only called on to account for three of the six days or periods of the creation, inasmuch as geological systems and formations regard the remains of the three great periods of Plants, Reptiles, and Mammals, *and those only.* He therefore accounts for the periods of the third, the fifth, and the sixth days, and shows that the sequence of Plants, Reptiles, and Mammals, are the same in the Mosaic and Geological records; but with respect to the others,—viz. the period of the first day, during which light was created,—

[9] Geology and Religion, p. 103.

[1] The Two Records. A Lecture, p. 18.

the period of the second day, during which the firmament was made to divide the waters below from the waters above it,—and the period of the fourth day, when the heavenly bodies became visible from the earth's surface,—he observes, that of them, *we need expect to find no record in the rocks;* and accordingly he leaves untouched and unexplained those portions of the Mosaic narrative. We propose to proceed further, and to show that Geology furnishes us with facts that confirm and corroborate the truth of every statement in the record of Moses, from the beginning down to the creation of Man—the original state of the Globe without form and void—the first dawn of light—the formation of the firmament, and the separation between the waters below and the waters above it—and the first appearance of the Sun, Moon, and Stars on the fourth day, intermediate between the creation of the vegetable world on the third, and the creation of the Creeping things and Birds on the fifth day. This will supply what is wanting to complete the harmony of the two Records; and will furnish the believer with evidence of divine inspiration that must confound and silence the Sceptic, and establish and authenticate, not only the Mosaic narrative, but, through it, the whole canon of Scripture.

CHAPTER IV.

THE TWO RECORDS COMPARED.

"Finds tongues in trees, books in the running brooks,
Sermons in stones, and good in every thing."—*Shakespeare.*

THE Mosaic Record of the Creation which we are now about to examine, whether of divine or human origin, purports to be a narrative of events, of which our planet was the theatre at some period between its first formation and the birth of Adam. It may be, that it is an epitome of all the vicissitudes and changes which have occupied the vast space of time which intervened between "the beginning" and the completion of the work of Creation; or it may be, that it is a detail of the events that occurred during the short period of the six concluding natural days. The former is confessedly the most natural and appropriate interpretation, if the facts of Geology will admit of such a construction; though the latter has been more generally adopted, through what we shall prove to have been a misapprehension regarding the inconsistency of Geological phe-

nomena with the Scripture narrative. But whether it be the history of the whole period of the pre-Adamite world, or only of its six closing days, the Mosaic narrative is the record of all that is pre-eminently ancient—and not only that, but is itself the most ancient book or written record in the world. This is a fact conceded by the infidel; for Porphyry, the most determined and formidable of all the antagonists which Revelation has had to encounter, admits, after patient research, that Sanchoniathan was the most ancient of profane authors, and that his writings contain copious extracts from the Books of Moses. It must also be admitted, that in simplicity and dignity of language and structure, the opening scene of the Creation has never been surpassed by any of the writings, sacred or profane, which have succeeded it. Our present task is, to establish its comprehensiveness, truth, and accuracy, as a description of the general plan and system of Creation from "the beginning," or first formation of the Heaven and the Earth, down to that of Man.

"IN THE BEGINNING GOD CREATED THE HEAVEN AND THE EARTH. AND THE EARTH WAS WITHOUT FORM AND VOID; AND DARKNESS WAS UPON THE FACE OF THE DEEP."

This opening passage of the written Record discloses to us that there was a beginning, and a Creator of the Heaven and of the Earth, or the

material globe on which we dwell; but it affords us no direct information as to the time of the commencement of the Creation. From geological and astronomical discoveries, however, we learn that an almost inconceivable series of ages must have passed away since the Heaven, including the heavenly host of Sun, Moon, and Stars, and the terrestrial Globe, were ushered into existence.

The light of the most distant cosmical body in the realms of space, offers us the most sensible evidence of the existence of that body. Therefore, as it has been calculated by Herschel, that the light of the most remote of the nebulæ discovered by his forty-foot reflector, travelling at the rate of 200,000 miles in a second of time, must have occupied the duration of two millions of years on its way to the earth, the creation of that nebula, one of the heavenly host, must be of that antiquity at the least; for the object must have been in existence in the sidereal heavens, in order to send out those rays by which it is now perceived by the inhabitants of our planet. How much longer it may have existed, or how many more of such bodies are in existence, whose lights have not yet reached the earth, it is impossible to conjecture.

Again, the period which must have elapsed since the first sedimentary rocks began to be deposited on their granite base, is the shortest date that can

be suggested of the Earth's existence; and calculating the time occupied by the deposition of the whole series of sedimentary rocks, upwards of fifteen miles in thickness, by our experience of the rate of progress of such an operation in the superficial accumulations which surround us, four or five millions of years must have elapsed since the commencement of the formation of the first stratified rocks. This is, of course, only an approximation, and a very uncertain one, to the date of the Earth's existence, as we have no means of ascertaining, with any degree of exactness, the rate of these sedimentary accretions in the primeval ages. But still it is an approximation, and affords some evidence of the earth's antiquity; for while there may have been circumstances causing the deposit of the sedimentary strata to accumulate more rapidly at some periods, there may have been circumstances under which they were accumulated more slowly at others. Therefore, whether we ascend to the heavenly regions, or descend into the earth for information and instruction, we learn that millions of years must, in all probability, have passed away, since the Heaven and the Earth issued from the hands of their Creator, to become a theatre for the manifestation of his wisdom, power, and goodness.

Still, however remote it may have been, we know from Geology, in confirmation of Scripture,

that there was *a beginning*, when the Universe was formed out of nothing; and the first picture of our planet, after its entry on the stage of its existence, disclosed by the written record, is that it was "without form and void, and darkness was upon the face of the deep." The more correct rendering of the original Hebrew text (תֹּהוּ וָבֹהוּ) is, that the earth was *invisible and unfurnished*, "αορατος και ακατασκευαστος," as expressed in the Septuagint version—*invisible*, inasmuch as it was covered with water, and enveloped in the darkness that was on the face of the deep,—and *unfurnished*, inasmuch as no organic forms of plants and animals had yet been called into being. Wrapped, then, in its watery garment, and enveloped in thick darkness, without a living creature of the animal or vegetable world within its precincts—a *dark*, *untenanted*, *watery waste*,—is the simple condition of our planet when introduced to our notice in the Book of Moses. Let us now turn to the Book of Nature, and inquire to what extent it corroborates the foregoing picture.

First—Geology has taught us that there was a time, far away in the remotest of the remote ages of the pre-Adamite world, when the first series of the sedimentary or stratified rocks were deposited on the primordial granite; and during the long period of the formation of the first, or Azoic sys-

tem, which is 26,000 feet, or nearly five miles, in thickness, there is every reason to believe that the waters of the deep were spread over the whole surface of the globe, from the circumstance of these rocks being found in nearly every accessible part of it; inasmuch as in that case, the seas in which they were deposited must have been co-extensive with the rocks themselves. We have already seen[1] that there is nothing in geological phenomena to contradict this fact, but, on the contrary, every thing to render it probable, that down to the close of the Silurian system, at which time we find the *first traces of fossil remains of land vegetation*, the waters prevailed every where, and that

> "Over all the face of Earth
> Main ocean flowed."

Secondly—As to *the darkness* which is stated to have rested on the face of the deep, it is not to be expected that the rocks then deposited, or any other now existing matter, could be of much assistance to us in confirming that fact. Nevertheless, a consideration of the actual state of the material world at that period, coupled with the nature of the bottom or Azoic rocks, will be found to aid us in our endeavour to confirm even that statement of Holy Writ. The principal ingredient of these bottom rocks is evidently mud, mixed in

[1] Ante, pp. 37. 39.

its earlier stages with the detritus of granite; and we have already seen that the granite crust of the earth was formed by the gradual cooling down of the molten mass of terrestrial matter, so that when the first strata of these bottom rocks were being laid down on this crust, the strong internal heat must have kept the watery surface which was spread over it, in a continual state of evaporation; and in the absence of an atmosphere, which was not created till the second day, such evaporation would take place even at a very low temperature. This boiling ocean, mingled with the gaseous exhalations emitted from the heated earth, and the torrents of mud out of which the bottom rocks were then being formed, must have spread a canopy of darkness over the face of the deep as long as the chaotic turmoil was in action. By the gradual cooling down of the Earth's crust, the muddy vapour must have subsided, until at last it became sufficiently pellucid for the admission of light. Till then, all must have been darkness on the surface of our planet.

Thirdly—At this period the earth was *unfurnished with physical* life; for it appears from the investigations of the geologist, that notwithstanding the most diligent search in every part of the globe, no fossil remains of animal or plant are to be found in the Azoic rocks, or in the igneous base of

granite on which they rest; and therefore (though the evidence is only negative in its nature) we are warranted in the conclusion, as a corroboration of Scripture, that no animal lived, and no vegetation grew, on the face of our planet, previous to, or during the formation of, the bottom or Azoic system of rocks.

Thus, we have every reason to conclude, that after the creation of the Heaven and the Earth, the Earth was for a time *covered with water—invisible*, having its surface veiled from the admission of light, and darkness on the face of the deep —and *unfurnished* with aught of animal or vegetable life; and that it continued in that state, "without form and void," during the long period of the formation of the Azoic system of the stratified rocks. So far the Book of Nature confirms the written Record.

"AND THE SPIRIT OF GOD MOVED UPON THE FACE OF THE WATERS."

This passage, which does not appear to have attracted particularly the attention of commentators, we shall find to be of the utmost importance as a key to elucidate the harmony that will be found to exist between Scripture and Geology. It has been construed by some as a statement that a

mighty wind had moved over the face of the waters. But as there could be no wind when there was no atmosphere, and as the atmosphere was not in existence until the second day of the creation, this interpretation cannot be sustained. It has also been construed as an announcement merely of the presence of the Spirit of the Deity. But a statement of the mere presence of the Omnipresent with that which He had created, such as "on the face of the waters," would be unmeaning and insensible, and not at all in accordance with the usual economical precision of the divine historian's language. What the Creator had created, He must have been present with. This passage must therefore have been intended to convey something more specific—some special operation of the Divine Spirit on the waters with which He had enveloped the earth.

Hitherto we have nothing on the scene of the Creation but mere inorganic matter. But no combination of inorganic matter could produce organic life. This announcement of the moving of God's Spirit on the waters must, therefore, we conceive, be intended to convey the first act of the creation of life, the pouring of vitality into the waters; and when the Spirit of God moved on the face of, or throughout, the waters, the first created living

animals started into existence[2]. Nor is this construction without Scripture warrant; for we find the Psalmist, in reference to various animals of the earth and sea which he had been enumerating, stating, "Thou takest away their breath, they die, and return to the dust. Thou *sendest forth thy Spirit, they are created:* and thou renewest the face of the earth[3]." We likewise find in Ezekiel's vision of the valley of dry bones, that the vivification of the lifeless forms is ascribed to the presence of the πνευμα, or Spirit. The sinews and flesh came upon the dry bones, which is a picture of organization *without life;* and the Spirit of God moved over the mass, and *they lived.* In the Book of Job, we also find, "by his Spirit he hath garnished the heavens[4]," and "the Spirit of God hath made me[5]." Theodoret seems to have taken the same view of the meaning of this passage, τισι δοκει το παναγιον πνευμα ζωογονουν των υδατων φυσιν[6], i.e. Quibusdam videtur fuisse Spiritum Sanctum qui vivificabat et fœcundabat aquarum naturam.

[2] According to Gesenius, the word מְרַחֶפֶת, which is translated in our version "moved," comes from "רָחַף to be moved with affection (Piel), to brood over young ones, to cherish young as an eagle—Deut. xxxii. 11—figuratively used of the Spirit of God, who brooded over the shapeless mass of the Earth, *cherishing and vivifying.*"

[3] Ps. civ. 29, 30. See also Ps. xxxiii. 6.

[4] Job xxvi. 13. [5] Ib. xxxiii. 4.

[6] Quæst. viii. p. 13, ed. Halens.

We are not, therefore, without warrant, in construing the announcement that "the Spirit of God moved on the face of the waters," as intended to convey that God had commenced his work of *impregnating the waters with life;* and if so, the first created of living creatures must have been *wholly submarine.* It was on the waters that the Creator's Spirit moved, or brooded; and it is, therefore, in the primeval waters that the first created being with life is to be sought for. If these views are correct, then, according to Scripture, no land has yet appeared above the surface of the universal ocean—no ray of light has yet reached the globe—but there existed some species of submarine organic life. Is this picture realized by the facts of Geology? Let us consult the Record of the rocks.

Passing upwards from the Azoic rocks, which testify that the Earth was till then "without form and void," invisible, and unfurnished with life or light, we arrive at the Silurian system, which succeeded, in point of time, and was deposited on the Azoic strata; and in it are discovered the first traces of the fossil remains of organic life, Fucoids, Zoophytes, Mollusks, and Crustaceans[7],—all of them specimens of *exclusively submarine beings.* In

[7] Ante, p. 31.

these classes are comprehended the whole population of the Silurian age. But it is of importance to our present inquiries, that we should ascertain, as far as practicable, the order of their existence, that is to say, of their creation.

It is obvious that the creatures, whose fossil remains are found in the lowest beds of the Silurian strata, were the first that existed on the face of our planet; and it is remarkable that the organic contents of these lowest beds correspond with each other in the most widely separated localities throughout the earth. Sir Roderick Murchison, speaking of the lowest zone of animal life in Great Britain, states that "the *lowest beds* have only been found to contain certain Fucoids and a rare Graptolite, a genus of Zoophyte[7]." These little serrated creatures, which resemble combs in their appearance, he observes, "are found in beds of *muddy origin*, and exclusively in the Silurian or earliest known system of fossil animal life." The fossil remains of the next "primeval zone of life in North Wales," according to the same high authority, "consist notably of the flat bivalve Mollusk, the Lingula[8]," which, in form, resembles a diminutive cockle or muscle. This also is known, from the horny nature of its shell, to have been the inhabitant of a muddy

[7] Siluria, pp. 36. 46.

[8] Ib. p. 40.

sea bottom, which contained little or no lime, or calcareous matter, to supply the fabric of a more perfect shell. The rocks in which these fossil remains have been found are styled by Sir Roderick Murchison "mudstones," from the nature of the deposit of which they are evidently formed. Such are the earliest fossil remains which are found in the Silurian rocks of North Wales; and the lowest band of the same system presents similar organic remains in Norway, Sweden, Russia, Bohemia, in the Skiddaw slates of Cumberland and Westmoreland, and in the Potsdam Sandstones of North America—in short, in every place in which these rocks are found. Difference of latitude presents no corresponding difference in species, as is the case in later periods of the world's history.

Thus, according to the Geologist, Fucoids, Graptolites, and Lingulæ were, as far as his researches extend, in existence before any other species of creatures; and were, therefore, the earliest created beings—heralds of a world of life[9].

[9] A fossil Zoophyte of simple structure and low organization (the Oldhamia) has been recently discovered in the rocks at Brayhead, near Dublin, which belong to the Azoic or Cambrian system—so that these bottom rocks in Ireland cannot be termed wholly unfossiliferous. The great mass of them are, however, devoid of any appearance or trace of fossil remains. This removes the commencement of organic life to a point of time more distant than the commencement of the Silurian system, somewhere in the Azoic or Cambrian epoch.

The only senses with which the Zoophyte, or a Bivalve of the lowly nature of the Lingula, could have been endowed, were those of touch, taste, or smell. It could not be contended that they were furnished with the organs of *sight or hearing*—in point of fact, they were devoid of both. But as we rise in the Silurian strata, advancing in time up the steps of creation, we are presented with submarine animals of higher classes of organization, and endowed with these higher organs of perception[10]. We find, for instance, the Trilobite, the most remarkable Crustacean of the Silurian epoch, whose eye presents us with an optical instrument, formed on the most accurate dioptric principles, for the perception and enjoyment of light by animals of that form and condition. The Cephalopod, also, was furnished with organs of vision and hearing. But the first-created Zoophytes and Bivalve Mollusks, not having been furnished with any such organs, we are warranted in concluding that they were ushered into existence before that

[10] "All Turbinated and simple shells (Univalves) are constructed by Mollusks of a higher order than the Conchifers, which construct Bivalves; the *former have heads and eyes;* the Conchifers, or constructors of Bivalves, are without either of these important parts, and possess but a low degree of any other sense than *touch and taste.* Thus the Mollusk, which occupies a Whelk, or a Limpet shell, is an animal of a higher order than the Conchifer enclosed between the two valves of a Muscle or an Oyster shell."—Buckland's Bridgewater Treatise, vol. i. p. 296.

the divine fiat had gone forth for the appearance of light on our planet, to terminate the reign of darkness upon the face of the deep. Had the earliest created animals been furnished with organs fitted for the perception of light, no reasoning mind could adopt the proposition that they were in existence when and where no light could reach them. The mutual adaptation of light to the eye, and of the eye to light, is so obvious, that in all our investigations of the relations of the animal and physical worlds, we naturally conceive that the existence of the one necessarily implies that of the other; and therefore, the absence of the visual organs in the earliest created animals, is another corroboration of the Mosaic narrative, that "the Spirit of God moved on the face of the waters," and infused them with life, before that light had been permitted to penetrate into their depths.

Such being the nature of the submarine animal creation, it is clear, that while some of them might have been, and in all probability were, created before light was admitted to the surface of the Globe, others of higher organization, and furnished with organs of sight, were not created until after the admission of light into the ocean's depths—and there is nothing in the Mosaic narrative at all inconsistent with such a state of facts. The creative Spirit of God moving in the waters, may, consis-

tently with the Scripture record, have continued, not only during the first day, or era, of the creation, but during the second and also the third, as we shall presently find was the true state of the case. So that while light was being introduced upon the earth, and while the firmament, or atmosphere, (the work of the second day,) was in course of formation, and even when the land vegetation was in progress of creation on the third day, the Spirit of God was introducing into the waters new forms of aquatic life—first, Zoophytes and Mollusks of a low organization, such as the Graptolite and Lingula—secondly, the higher classes of submarine invertebrates, such as the Trilobite and Cephalopod —and thirdly, the still higher class of Vertebrate Fishes. Geology establishes these facts; and the Mosaic record is in perfect harmony with them.

It has been generally supposed that the submarine animals formed part of the work of the fifth day of the creation. It would follow, therefore, if that supposition be correct, that their introduction in this section of the Mosaic narrative, is not only unnecessary, but inconsistent with the text of Scripture. But it will appear, when we come to the consideration of the work performed by the Almighty on the fifth day, that this class of aquatic creatures is not included among those which, we are told, came into existence at that

period. That creation was, we shall find, of a *wholly different order of animals;* and, therefore, if the creation of the submarine invertebrates is not included in the descriptive language of "the Spirit of God moving on the face of the waters," no notice of their creation will be found in any part of the Mosaic narrative.

There is, moreover, a plain reason, which we learn from Geology, for this somewhat indirect mode of announcing the submarine creation, so as not to be confined to any one of the days, or eras, of creation—and that is, that the organic remains of the Silurian and Devonian strata show that the existence of submarine animals may have commenced, and, in all probability, did commence, before the dawning of light on the deep, and was, we know, continued subsequent to that event; and that some of the species, viz. Fishes, were not in existence until the commencement of the work of the third day. There are, in fact, three classes of submarine animals: first, Zoophytes and Bivalve Mollusks, without visual organs; and which, therefore, *may have existed before light*—second, the higher classes of Mollusks and Crustaceans, furnished with organs of sight; and which must have come into existence *after the creation of light*—and third, the still higher class of Vertebrate Fishes. The first class was created on the first day before

the dawn of light—the next, on the second day, after the appearance of light—and the last, we know to have come into existence contemporaneously with land vegetation, viz. on the third day of the creation. So that the creation of this portion of the animal world must have extended through three at least of the Mosaic days, and could not therefore, consistently with truth and accuracy, have been announced as a separate item of creation confined to any one of them; and had the Mosaic record declared that the submarine animals were created on the first, or on any single day of the creation, it must have been contradicted by Geology. But, as expressed, there is no contradiction between what has been written, and what has been brought to light by the Geologist. According to both, the Spirit of God moved on the waters on the first day; but when He ceased to produce submarine animals is not stated in Scripture, nor established by Geology. How beautifully, then, do the facts of Geology illustrate the language and structure of the inspired Record! And we may with truth add, that no mode of expression could more appropriately convey the true state of the facts disclosed by the records of the Rocks, than that which has been used by the inspired penman. This will appear even more clearly as we proceed.

There is a further, and, as it appears to us, most satisfactory reason for the form of expression which has been adopted by Moses in this place, and for the structure of this portion of his narrative. The scene of the creation was, as we have already suggested, in all probability, communicated to the divine historian through the medium of a vision; and if so, he could only have recorded or described what had met his eye, or was communicated to his ear; and accordingly, he records that part of the creation which he saw or heard, and not that part of it which he could not have seen, or did not hear. He therefore announces the divine fiats which he heard, and the consequent dawn of light—the formation of the atmosphere lifting up the clouds—and the appearance of dry land and vegetation, all of which he saw—omitting that which he could not have seen, viz. the submarine animals; and only announcing with respect to them, what may have been communicated to his senses, as to Ezekiel in the vision of the valley of dry bones, that the Spirit (πνευμα) of God was moving on the waters, breathing life into them.

Thus then is the Scripture picture realized by Geological facts. Organic life before light—the creative Spirit of God moving on the still darkened waters—and no symptom of dry land. The work of furnishing the Globe with life has commenced;

but hitherto, as both Geology and Scripture testify, water pervades the whole surface of it; and its sole occupants are Fucoids, Graptolites, and Lingulæ, and, it may be, some other submarine creatures of equally low organization and limited senses.

It is manifest, therefore, that our planet, previous to the first dawn of light recorded in Scripture, was not in the state of wreck and ruin of a former world of life and being described by Chalmers and Buckland. It was not then, as they have suggested, a vast cemetery of *extinguished races of plants and animals;* but may, with more propriety, be described as the dark womb in which the embryo of a world of life was beginning to move. Since the Heaven and the Earth issued from the hands of their Creator, untold ages, represented by the formation of the Granite crust on the molten mass, and the deposition of 26,000 feet of the bottom rocks, have rolled away, before that the dark depths of the primeval waters are stirred by the vitality of the lowly Fucoid or humble Zoophyte; and untold ages are yet to elapse, before that a being of intellect and responsibility shall visit the scene. Slow and gradual is the progress upwards through the intermediate classes of the animal creation; but every moment will be fully occupied in the work of adapting the earth to be a fit habi-

tation for the human race; and which may thus be said to have been in preparation for them from the foundation of the world.

We are now, as Scripture teaches and Geology confirms, on the confines of the living world. Behind us all is void and empty, and at our feet a scanty race of Zoophytes and Bivalve Mollusks, the lowest items in the scale of created beings; insignificant in the eyes of man, but of vast importance at the period of their existence, and deeply interesting as the first organic forms in which the mystery of life was developed on our planet. But no ray of light has yet reached the surface of the globe. The black pall of an unbroken night still invests

> "The world of waters dark and deep
> Won from the void and formless infinite."

But the fiat of the Almighty went forth,—

"AND GOD SAID, LET THERE BE LIGHT, AND THERE WAS LIGHT. AND GOD SAW THE LIGHT THAT IT WAS GOOD: AND GOD DIVIDED THE LIGHT FROM THE DARKNESS. AND GOD CALLED THE LIGHT DAY, AND THE DARKNESS HE CALLED NIGHT. THEN EVENING WAS THEN MORNING WAS, ONE DAY[1]."

[1] This is the correct translation of the Hebrew original. The expression יוֹם אֶחָד does not signify "the first day," as it has been rendered in our version, but "one day." In the 8th verse, the expression יוֹם שֵׁנִי, by reason of the absence of the definite article הַ ought to be translated "a second day." The same observation applies to the several announcements of the third, fourth, and fifth days, in each of which the definite article is

This divine command, and the result of it, does not negative the previous existence of light as a part of the original creation, or as one of the primitive qualities of the Sun and others of the heavenly bodies. It only conveys the information that light was commanded to shine, where, we are told, darkness had been resting till then, that is to say, on the waters which encompassed the Earth. "Darkness was upon the face of the deep; and God said, Let there be light," *to dispel that darkness.* The Sun had sent forth his rays from the date of the creation, but the black misty envelope of the deep could not be penetrated until the divine fiat went forth for the advent of light to its surface. The opaque gaseous vapours that were circling round the Earth, while the mud of which the bottom rocks was formed was in progress of deposition, had subsided, and light could penetrate the waters: and that it did penetrate the depths through a pellucid medium, during the formation of the Silurian system, (though not in its earliest stages,) is manifest from the organs of vision with which a great proportion, though not the first born, of the

wanting, and the proper translation is, therefore, "a third day," "a fourth day," "a fifth day." But in the announcement of the completion of the sixth day, in the 31st verse, the article הַ renders the expression יוֹם הַשִּׁשִּׁי definite, and therefore, it is properly translated "the sixth day."

animals of that period were furnished. This is the simple confirmation of the Scripture text, "Let there be light;" for light which now exists, must have existed when the Trilobites and other Crustaceans of the Silurian system were in being; while, on the other hand, there is no necessity for its previous existence, the creatures which then existed having been devoid of organs of sight.

But though *Light*, the fairest portion of the creation, and without which no part of it could be fair, had reached the earth, it was not poured forth on it in its fulness at once. As regards our planet its creation was *progressive;* and ages elapsed before a direct ray revealed the forms of the Sun and other celestial bodies to an earthly eye. At first, it had to struggle through the aqueous vapours which rested on the waters before the creation of the firmament, or atmosphere. It was afterwards more evenly diffused by the intervention of the cloud-capped atmosphere, which came into existence on the second day of the creation. Behind the clouds the Sun remained throughout the second and third days, or eras, of creation; and on the fourth, the Heavenly host became, for the first time, visible to an eye situated on the Earth's surface. Such is the Scripture picture; vapours resting on the Ocean on the first day of Creation, before they were lifted up by the

atmosphere—unbroken clouds spread above the atmosphere throughout the second and third days; and withdrawn only on the fourth day, when the direct rays of the Sun poured their full effulgence on the Earth. Under these circumstances, Light must have been progressive; and the time which elapsed between the first and the fourth days of creation, may be compared to the slow dawn of a long morning, from the pale glimmer of approaching light to the bright sunshine of a cloudless sky. Strange as the proposition may appear, yet it will be found to be true, that the contents of the Rocks confirm and establish every line and letter of this Scripture revelation; and we shall prove, as we proceed, not only that such *may* have been, but that such *must* have been, the plan and course of the Creation.

With the first dawn of light, and the consequent division between light and darkness—day and night—on the globe, the first day, or era, of the Creation, terminates—"then evening was then morning was, one day." This era commenced with the creation of the Heaven and the Earth, invisible and unfurnished, enveloped in darkness, and devoid of either animal or vegetable existence; and it did not terminate until it had witnessed the commencement of animal life, and the introduction of light upon the globe. Its continuance was from

"the beginning" throughout the long ages in which the Azoic rocks were, grain by grain, and layer by layer, raised by deposit from the granite bed of the ancient ocean, to the height of nearly six miles, and until after the deposit of the earliest strata of the Silurian system, in which are found the first glimmerings of organic life—the Spirit of God moving on the face of the waters.

But beside the liquid ocean which was wrapped around our globe, it has yet to be enveloped in its other ambient covering, the aërial atmosphere, necessary for the respiration of the various races of the animal and vegetable world, which are to be introduced in the process of furnishing it with the glories and beauties of animated nature; and necessary also, for the diffusion of light and transmission of sound. This is the work of

THE SECOND DAY.

"AND GOD SAID, LET THERE BE A FIRMAMENT IN THE MIDST OF THE WATERS, AND LET IT DIVIDE THE WATERS FROM THE WATERS. AND GOD MADE THE FIRMAMENT, AND DIVIDED THE WATERS WHICH WERE UNDER THE FIRMAMENT FROM THE WATERS WHICH WERE ABOVE THE FIRMAMENT: AND IT WAS SO. AND GOD CALLED THE FIRMAMENT HEAVEN. AND EVENING WAS AND MORNING WAS, A SECOND DAY[2]."

The literal meaning of the Hebrew word, which is here translated "firmament," is "expansion;"

[2] Ante, p. 138, n.

and, as appears by the context, it is intended to describe, what we denominate, "the atmosphere," and for which there is no other corresponding term in the Hebrew language; for it is the atmosphere alone which divides the waters below from those which are bound up in the clouds above. The face of the globe was, at the commencement of this day's work, still covered with water, which was in a continual state of evaporation, by reason of the high terrestrial temperature, arising from the central heat; and after reaching a certain elevation, where, by removal from the earth, it entered into a cooler region, it became condensed, and was again precipitated, by the earth's attraction, on the face of the waters from which it had arisen. In this state of things, the introduction of an elastic atmosphere of the nature of that which now embraces the earth, would have the effect of upholding the aqueous vapours in masses of clouds, which would occasionally pour down their contents on the face of the waters below. There would therefore be, as long as the high temperature of the earth continued, a constantly ascending vapour, or steam, forming itself into masses of clouds, and streaming down from time to time in tepid showers. Such a canopy of cloud would effectually exclude the direct rays of the Sun from the earth, and render the surface of it a vast humid hothouse, eminently cal-

culated for the production of an extensive and luxuriant vegetation. This is what the Book of Nature teaches us, and it is in perfect consistency with the Mosaic description of the firmament, dividing the waters below from those above[3].

The period of the third day of the Creation, during which the elastic fluid of an atmosphere was in progress of formation, was that in which the greater part of the Silurian system of Rocks was deposited; and the organization of the creatures which we know to have then come into existence, such as the various classes of Trilobites, Ammonites, Cephalopods, and other Crustaceans and Mollusks, similar in structure and habits to many of the present day, is strong evidence that the water and atmosphere in which they dwelt, could not have differed essentially, in nature and composition, from the water and atmosphere encompassing the Crustaceans and Mollusks which are the contemporaries of the human race. An atmosphere, or "firmament," must therefore have been then in existence, or in process of formation. So far the Book of Nature confirms the Book of

[3] It is probable that the belts of the planet Jupiter are masses of unbroken clouds, produced, and still continued, under similar circumstances to those that formed and sustained the clouds, which shut out the direct rays of the Sun and other heavenly bodies from the surface of our own planet, throughout the first three days, or eras, of the creation.

Genesis. We shall find further corroboration as we proceed through the contents of the succeeding formations.

We are now, according to Genesis, at the close of the second day of the Creation, and according to Geology, at or near the close of the Silurian system. If we have rightly interpreted the former, the world that was dark, and "without form and void," is now decked with light, clothed with an atmosphere, and furnished with submarine animals; and if the Geologist has rightly read the stony leaves of the Book of Nature, our planet, at the close of the Silurian epoch, was inhabited by a population wholly submarine, and which must have required both light and air for its existence.

Here terminates the aqueous or watery era of the Globe. Its duration, though coeval with the long ages occupied by the deposition of the vast rocks of the Azoic and Silurian strata, may nevertheless be termed the youth of our planet; and throughout that period, from "the beginning," no island rose from the bosom of the shoreless ocean, whose tides and billows circled the Globe, and swept without a breach from pole to pole. Nothing met the divine historian's eye, and nothing has been chronicled by his pen, but water below and clouds above, with dim diurnal light and nocturnal darkness alternately pervading all. Living crea-

tures were beneath the surface of the deep, but could not have formed part of the divine vision, and are therefore undescribed and unrecorded by Moses, further than what may be implied from his announcement that "the Spirit of God moved on the face of the waters."

Thus far the revelations of Scripture and the facts of Geology coincide, without a shadow of variance. The geographical extent of the Azoic and Silurian rocks, and the absence of the fossil remains of terrestrial plants and animals throughout, are strong testimonies to the truth of the revelation that land has not yet emerged from the deep. But that event is near at hand: and dry land, or the earth, with all the eternities of weal and woe involved in that word, is for the first time about to appear amid the world of waters, to become the stage of progressive creation.

THE THIRD DAY.

"AND GOD SAID, LET THE WATERS UNDER THE HEAVEN BE GATHERED TOGETHER UNTO ONE PLACE, AND LET THE DRY LAND APPEAR: AND IT WAS SO. AND GOD CALLED THE DRY LAND EARTH; AND THE GATHERING TOGETHER OF THE WATERS CALLED HE SEAS; AND GOD SAW THAT IT WAS GOOD. AND GOD SAID, LET THE EARTH BRING FORTH GRASS, THE HERB YIELDING SEED, AND THE FRUIT TREE YIELDING FRUIT AFTER HIS KIND, WHOSE SEED IS IN ITSELF, UPON THE EARTH: AND IT WAS SO. AND THE EARTH BROUGHT FORTH GRASS, AND HERB YIELDING SEED AFTER HIS KIND, AND THE TREE YIELDING FRUIT, WHOSE SEED WAS IN ITSELF, AFTER HIS KIND: AND GOD SAW THAT IT WAS GOOD. AND EVENING WAS AND MORNING WAS, A THIRD DAY."

The Scripture narrative of the work which was performed by the Almighty on this day of the Creation is simple and unequivocal—the formation or appearance of dry land above the wide expanse of the waters, and the creation of land vegetation to grow and propagate itself upon the surface. Such being the declaration of the divine Record, let us now read the testimony of Geology.

First, as to the formation of the dry land. We are now at the closing scene of the Silurian, and near the commencement of the Devonian, or Old Red Sandstone system; and all Geologists concur in the fact, that from the appearances which these formations present, this period must have been one of extraordinary volcanic disturbances. According to Hugh Miller, the Devonian epoch was ushered in with elementary tumults, which he assimilates to the uproarious opening scene of Shakespeare's "Tempest;" and, without doubt, all the principal mountain chains in the world were then upheaved. This is not conjecture, as we have stated before [4], but founded on evidence of the most satisfactory and conclusive nature. The position of the Silurian strata on the sloping sides of these mountains demonstrates to the practical Geologist, that the exact period of their elevations was at the close of the Silurian system, and when the deposits of the

[4] Ante, p. 42, n.

Devonian were about to commence; and these phenomena are sufficient and adequate to account for the upheaval of dry land above the surface of the waters. Such elevations by volcanic protrusion, are obviously the only conceivable mode by which continents and islands could be made to appear on an expanse of ocean such as then overspread the face of the Globe,

> "The mountains huge appear
> Emergent, and their broad bare backs upheave
> Into the clouds."

Not less satisfactory, as a confirmation to a reasoning mind, of this having been the date of the first appearance of the dry land, is the fact of the entire absence of any trace of land vegetation in any of the previous formations, and the undoubted evidence of their presence in the earliest stages of this, as we shall now proceed to show.

Secondly, the testimony of Geology with respect to the origin or first appearance of land vegetation is distinct, and confirmatory of the Scripture record of their creation. It has been already stated, on the high authority of Sir Roderick Murchison, that the first appearance of land plants was at the very top of the Silurian Rocks, where the Old Red Sandstone rests upon them. He further states, "that there are no traces of land plants in the great mass of the Silurian rocks; and it is only

where the uppermost strata unite with the Devonian that certain traces of land plants have been sparingly detected. Even in the Devonian rocks such plants are rare, and only begin to prevail as we pass upwards, and are surrounded by the spoils of the first great woody era" (the Carboniferous)[5]. This is evidence of the highest value, and above suspicion; and nothing can be more distinct and conclusive as to the fact of *land plants having appeared, for the first time*, at the close of the Silurian and commencement of the Devonian or Old Red Sandstone era—at first, scanty and lowly, but increasing in number, size, and extent, until they expanded into the luxuriant vegetation, out of which the great coal deposits were formed. So far all is harmony between the Record of Moses and the Record of Geology. Not only is there no inconsistency or variance between them, but the one is confirmed in every particular by the other; and as we proceed upwards and onwards in tracing the contents of the two Records, they will be found to correspond with astonishing accuracy at every step.

According to the Mosaic narrative, a great and extensive revolution in the physical world took place on the third day, or era, of the creation. Earth, the future abode of the air-breathing tribes of

[5] Siluria, p. 267.

animals, including the human race, began its existence in the midst of what had been till then a world of waters. But from Geology we learn—what is not, and ought not to have formed, part of the Mosaic narrative—that an equally important addition was, at the same period, made to the animal world, by the creation of the first species of Vertebrates (which is the model or type on which Man was afterwards framed), in the form of Fishes. Hitherto the invertebrate Crustacean, a creature without a bony skeleton or brain, was the highest in the class of living beings—the Masterpiece of God's workmanship, and the Monarch of his mundane creation. But, with land and land vegetation, Fishes appeared for the first time, as the researches of Sir Roderick Murchison have fully established. Crustaceans and other submarine invertebrates continue to exist; but their sovereignty has departed, and the superior class of Vertebrate Fishes reign in their stead. Long ages must wax and wane before a creature of higher organization shall appear, to dispute their supremacy and dominion; and, during that period, the Earth will be clothed with those extensive and gigantic forests which characterize the Carboniferous era, the Geological phenomena of which will largely contribute to the establishment of the truth and inspiration of the divine historian, and fill up the Scripture

outline of the Creation; so as to present a complete and perfect picture of the power, wisdom, and goodness of the Almighty in his work of preparing the Earth for the succeeding classes of the animal and vegetable world.

But before we appeal to these Geological facts, to ratify and realize the Mosaic picture of God's work on the fourth day of the Creation, a few observations on some well-established principles connected with the nature and effect of the rays of sunlight on the vegetation of trees and plants, will be found to afford considerable assistance to our identification of the Scripture record with the revelations of Geology. The science of the Sunbeam, the most impalpable and evanescent of created existences, will aid us as much in the vindication of the truth of God's word, as the science of the Rocks, the most imperishable and unchanging of earthly substances.

In every Sunbeam that reaches the Earth, there is a combination of three distinct principles, which are known by the names of Light, Heat, and Actinism. *Light*, or the luminous principle, is that which is the cause of the varied hues and colours which greet our vision in every part of the universe. *Heat*, or the calorific principle, is that which regulates temperature, and excites motion throughout the world. And *Actinism* is a chemical principle,

which quickens life in the plant, and is productive of other molecular changes in various substances.

These principles, though combined in each ray, are nevertheless separable by certain mechanical contrivances from each other; and the effect of the Sunbeam on earthly substances depends entirely on the proportions in which they are respectively present in it. Thus, by the exclusion or diminution of the Luminous principle, a considerable change takes place in the efficacy of the Actinic principle; and it is found by experiment, that the germination of seeds and the growth of plants are more rapid and prolific under the influence of the Actinic, when separated from the Luminous, principle, than would be the case were they under the influence of the combined radiations. It is remarkable, however, that though, under such circumstances, a more rapid and luxuriant growth is exhibited, the plant, instead of solidifying, remains soft and succulent. Woody tissue will scarcely be formed at all, if the plant is deprived of the Luminous, and subjected to the influence of the Actinic and Calorific principles alone. It is the unclouded sunbeam which consolidates the fibres of the plant, and forms it into a hard woody substance. Every day's observation will to some extent confirm this; for the plants that spring up beneath the shade of trees, screened from the direct

rays of the sun, are rank and pulpy, while the same species of plant growing up in the open air is firm and healthy, though less advanced in size, and slower in growth. The direct rays of the Sun are, in point of fact, desolatory and inimical to vegetation; and therefore the circumstances best adapted for the production of a quick and profuse, though soft and succulent, vegetation, are those in which the plant is screened from the direct rays of the sun, and surrounded with heat and moisture.

In such a position, the plant has but little power to decompose the Carbonic Acid, which is the operation by which woody tissue is formed. Carbon is the food of the plant, and is as necessary for its existence and strength, as Oxygen is for the existence and support of animal life. This Carbon is extracted from the surrounding atmosphere, in which it is mingled with Oxygen and other gases; and during the daylight, the plant is constantly engaged in inhaling the Carbonic acid gas (a combination of Carbon and Oxygen) which is in the air, and exhaling the Oxygen arising from its decomposition. But, in the absence of light, this process of decomposition cannot be carried on, as it is wholly dependent on the excitement of light. During the night, the process is almost, if not wholly, suspended; but with the morning dawn, the plant begins to imbibe the Carbonic Acid, which

it has a power of decomposing, so as to retain the Carbon to build up its own woody structure, while it dismisses the Oxygen into the air for the nourishment of animals, whose health and strength, and, we may add, existence, is thus dependent on that of the vegetable creation in combination with the light of the sun. In shaded or clouded situations, the activity of this process of decomposition, which is suspended, as we have seen, during the night, diminishes in proportion as the rays of the Sun are excluded.

The green colour of the leaves of plants is derived from a compound called Chlorophyle, which forms in their cells, and in which there is a very large proportion of Carbon. The formation of this compound is wholly dependent on the influence of the rays of light, and is only produced by their presence. Plants which grow in the dark have no colour; and an anecdote in the "Gardener's Magazine" will illustrate the dependence of the formation of Chlorophyle, and, consequently, of the decomposition of the Carbonic Acid, on the influence of the direct rays of the Sun. It often happens in the extensive forests of America, that the clouds will, for many days in succession, interrupt the direct rays of the Sun; and in a particular district the Sun was, on one occasion, obscured in this manner for the space of twenty days,

during which time the leaves of the trees, under the combined influence of heat and moisture, were developed rapidly so as to attain their full size. Having thus expanded in the absence of a sufficiency of the luminous principle of the sunbeam, the Chlorophyle was not produced, and the leaves presented a pale whitish appearance, very unlike their natural verdant hue, until at length the Sun burst through the clouds, and poured its brilliancy upon the foliage of the trees. The effect was, that the formation of Chlorophyle instantly commenced, and before the Sun had reached its meridian, the pallid foliage had disappeared, and the forest was once more clad in its wonted garb of green. Had the Sun continued behind the canopy of clouds for a longer period, the formation of the Chlorophyle, and the consequent decomposition of the Carbonic Acid would have been proportionably suspended. Extending this principle to large tracts of land, covered with vegetation of this description, situate in a warm and damp climate, and shaded by dense unbroken clouds, the result would be, that while the vegetation increased rapidly, the atmosphere would continue to be poisoned with an undue proportion of Carbon, and remain an unfit habitation for air-breathing animals.

Thus it is obvious, that the unclouded rays of the Sun are absolutely necessary for the production

of hard woody tissue; and every tree of that description, when cut transversely, presents a series of concentric rings, varying in thickness, each of which represents the quantity of Sunbeam which has fallen upon it during each succeeding summer. The ring of wood is produced by the influence of the Sunbeam, and therefore indicates its extent in each season. These rings are called season rings, as they are successively formed in successive seasons. From this it follows, that in the absence of sunshine, as no hard wood could be formed, no season rings would appear in the sections of the tree; and further, that when the season rings are found, we may rest assured that the direct Sunbeam has reached the plant, and that summer and winter have alternated at the period of its growth.

From these observations, we may deduce the following propositions, which may be considered as well-established truths. First, that the circumstances best adapted for the rapid and profuse growth of vegetation, are those in which there is an exclusion of the direct rays of the Sun, and the presence of heat and moisture; but that the vegetation produced under such circumstances will be soft and succulent, and present no traces of season rings. Secondly, that such circumstances are inimical to the extraction of Carbon by the growing vegetation from the atmosphere; and would therefore prove

highly prejudicial to the existence of terrestrial air-breathing animals.

It is a corollary to these propositions, that if in any district, and during a particular period, the vegetation is luxuriant and profuse in quantity, and soft and succulent in its nature or quality, we may rest assured that the direct ray of the Sun has been a stranger to that region, during the growth of such a vegetation. And if we further find, that in the same district, and at a subsequent period, the vegetation is hard and woody in its texture, and that it presents the season rings, we may be certain that the unimpeded Sunbeam has visited that district during that period, and that there have been alternations of summer heat and winter cold. We may add, that these distinctions of climatal conditions during the foregoing periods, will be confirmed, if we find that air-breathing animals were not in existence during the former, but were in existence during the latter, of those periods.

Let us now return to our two Records. We have passed through the era of the Devonian or Old Red Sandstone formation, which, as we learn from Geology, was ushered in with violent volcanic eruptions, by which vast mountain masses were upheaved. In this manner dry land appeared, and was clothed by the power and goodness of a beneficent Creator with vegetation, which has continued

from thence throughout all subsequent ages, for the use of the various races of animals with which the Earth has, from time to time, been furnished. From the same source of information we also know, that the creative Spirit of God continued to move in the waters; and while He was clothing the new-born Earth with vegetation, He was pouring into the seas the higher forms of submarine life, vertebrate fishes.

Passing upwards from the Old Red Sandstone, we now enter on that interesting and all-important period which witnessed the formation of the great Coal fields, the produce of a vegetation that has never been paralleled, even in the most favourably situated soils and climates of the world. That these vast and widely-diffused coal measures have been formed of vegetable matter is, as we have before observed, an admitted fact, established beyond dispute by the direct and unerring testimony of the senses; but how, or under what circumstances, the Earth of that era came to be clothed with such a gigantic and extensive vegetation, the Geologist has given no satisfactory explanation. His Record is silent on the subject. But the written Record of Moses will be found to afford important aid in unfolding one of the mysteries of this primeval era.

The Carboniferous epoch, or that in which this

abundance of vegetable matter arose from, and then descended into, the Earth, is that of

THE FOURTH DAY,

at the close of which, according to Moses, the heavenly host of Sun, Moon, and Stars were unveiled, and became, for the first time, visible objects from the surface of the Globe.

"AND GOD SAID, LET THERE BE LIGHTS IN THE FIRMAMENT OF THE HEAVEN TO DIVIDE THE DAY FROM THE NIGHT: AND LET THEM BE FOR SIGNS, AND FOR SEASONS, AND FOR DAYS, AND YEARS: AND LET THEM BE FOR LIGHTS IN THE FIRMAMENT OF THE HEAVEN TO GIVE LIGHT UPON THE EARTH: AND IT WAS SO. AND GOD MADE TWO GREAT LIGHTS; THE GREATER LIGHT TO RULE THE DAY, AND THE LESSER LIGHT TO RULE THE NIGHT: HE MADE THE STARS ALSO. AND GOD SET THEM IN THE FIRMAMENT OF THE HEAVEN TO GIVE LIGHT UPON THE EARTH, AND TO RULE OVER THE DAY AND OVER THE NIGHT, AND TO DIVIDE THE LIGHT FROM THE DARKNESS: AND GOD SAW THAT IT WAS GOOD. AND EVENING WAS AND MORNING WAS, A FOURTH DAY."

What the inspired penman intended to convey by this announcement, appears as well from the language as the structure of the narrative. With respect to the language, all philologists agree that it does not mean that the Sun, Moon, and Stars were, for the first time, called into existence at this period of the Creation. It may, and, as we shall presently find, does announce, that at this time, the Heavenly host, hitherto screened from the Earth by the clouds above the firmament, became,

by the ordinance and appointment of the Creator, the *visible* rulers and exponents of the times and seasons—"to divide the day from the night, and to be for signs, and for seasons, and for days, and years[6]." And that this is necessarily the meaning, is manifest from the structure of the narrative. For if, when Moses announced that in the beginning the Heavens were made, he included the Heavenly host as part of that creation, it would be a gross inconsistency, and we might say a contradiction of himself, to state afterwards that they were created on the fourth day. And even if the creation of the heavens could be construed as not including that of the Sun, Moon, and Stars, still it would be highly improbable that any but an inspired writer, would have penned a statement, by which the Israelites were called on to believe that light was created before that the Sun, from which

[6] Dr. Buckland, in reference to this passage, observes, "What is herein stated of the celestial luminaries seems to be spoken solely with reference to our planet, and more especially to the human race, then about to be placed upon it. We are not told that the substance of the Sun and Moon were first called into existence upon the fourth day: the text may equally imply that those bodies were then prepared, and appointed to certain offices of high importance to mankind; 'to give light upon the earth, and to rule over the day, and over the night,' 'to be for signs, and for seasons, and for days, and for years.' The fact of their creation had been stated before in the first verse."—Bridgewater Treatise, vol. i. p. 27.

it manifestly emanated, was in existence. It is plain, therefore, that the Israelites could not have understood the creation of the fourth day as a creation of the Heavenly bodies mentioned in it; and it follows, as a necessary consequence, that the language of Moses was not intended to convey any such idea to their minds.

It has always appeared to us, that the order in which the Mosaic narrative has recorded the first dawn of light on the globe, and the first appearance of the Heavenly bodies in the firmament, carries with it the strongest internal evidence of its inspiration and truth. For what uninspired writer would have ventured to inform his readers that light was created on the first day of the Creation, but that the Heavenly orb, from which it manifestly proceeded, had no place in the creation until a subsequent period? No person, except one who was writing under the dictation of the Spirit of God, would have ventured to postpone the introduction of the Heavenly bodies, the obvious sources of light, to the appearance of light itself. But how is this evidence of inspiration strengthened, when we find the unerring records of Nature testifying that light had dawned upon the earth ages before the luminaries of the Heavens could have reached any organ of vision that existed on it—

that the facts hidden from Moses in the bowels of the earth have been exhumed in these latter days, to bear witness to the truth of what he had written thousands of years ago; and which has been believed by millions of the human race, notwithstanding its *apparent* improbability and inconsistency. Truly might the Patriarch of old be said to have prophesied of this, when he exclaimed, "As for the Earth, out of it cometh bread; and under it is turned up as it were fire."

But what is this evidence? Reverting to the Mosaic Record, how speaks it? Darkness was on the face of the deep, clouds and vapours rested on the abyss of waters, until they were at length penetrated by the rays of light, though the Sun, the source of that light, was still invisible from the surface of the globe. The light of that era must have resembled that of a sunless, foggy day. Next, we are told, that the firmament or atmosphere was interposed, and the clouds arose and were spread above, still screening the surface of the waters and the dry land, when it appeared, from the direct rays of the Sun, Moon, and Stars. This dense canopy of clouds, "like a dark ceiling stood," throughout the second, third, and fourth days, or eras of the Creation; and during all that time, none of the then created animals had ever

basked in the heat, or gazed on the orb of the Sun—

> "For yet the Sun
> Was not; she in a cloudy tabernacle
> Sojourned the while."

All continued in this state until the work of the fourth day was completed, when the canopy of clouds was dissolved, and the earth and all the mundane creation beheld, for the first time, the hidden source of the light and warmth which had been so long the chief, but unseen, element of their physical enjoyment and well being.

In the mean time, on the third day of the creation, terrestrial vegetation had been commanded to spring up and deck with foliage the new-born earth, which had just emerged from the wide expanse of waters. Now, if the Mosaic narrative be true, the plants and herbage which had thus arisen at the bidding of the Almighty, found themselves in the midst of all that could operate to force and nourish a prolific, and, at the same time, a soft and succulent vegetation. *Shade, heat, and moisture* must have surrounded them on all sides—not fitful and varying, but constant and uninterrupted. Shade, by reason of the waters or clouds above the firmament; and heat and moisture, because evaporation was necessary for the supply and continuance of those clouds. Thus, according

to Moses, the Earth must have been in the condition of a *vast, shaded, humid hothouse;* which was eminently qualified, as we have already seen, for the production of a most profuse and rapid growth of soft and succulent plants.

Now, did such a vegetation exist at this period of the world's history? Let Geology answer. Every seam of coal that has been brought to light throughout the Earth, attests and proclaims the fact, that a vegetation which has never been paralleled in the most prolific tropical climates of the world of man, was, at this time, spread over every quarter of the globe in which dry land was to be found. Judging from the extent and thickness of the Coal measures, forest after forest, in countless succession, must have expanded into maturity, and sunk beneath the waters, when the mighty masses of this useful mineral were generated and preserved;—

> "Stage upon stage, high waving o'er the hills;
> Or to the far horizon wide diffused,
> A boundless deep immensity of shade."

From the same source, we learn the nature and texture of the plants of which these mighty forests were composed. It has been ascertained by geologists, as we have before stated[7], that one half at least of the vegetation of the Carboniferous era was

[7] Ante, p. 55.

of the Fern or Bracken tribe, and the remainder composed for the most part of Equisetaceæ, Calamites, Lepidodendra, and other cryptogamic and flowerless plants; all of which require, as we have seen, uninterrupted *shade, heat, and moisture*, for their production and growth in any abundance. They are all of them of a soft and pulpy nature; and that they were peculiarly so at this primeval period, is manifest from the fact that their huge trunks, several feet in diameter, were compressed and flattened by their own weight, wherever they happened to fall in a horizontal or inclining position. This appears from the impressions preserved in the Coal, which invariably present level or flat, instead of cylindrical surfaces; which latter must have been their conformation, if the wood had been of a hard texture.

Nothing can be more certain, than that the vegetation of the Carboniferous era was profuse in quantity, and of a quality that indicated the prevalence of *continued shade* for its production. It is equally certain, that such a vegetation could not have arisen in any place exposed to the direct rays of the sun; and we may, therefore, conclude that throughout, and until the close of, the Carboniferous epoch, the Sun's rays must have been veiled from the surface of the globe on which this vegetation was flourishing. In the next system,

the Permian, the profuse vegetation of the Carboniferous no longer exists, and the fossil remains of the plants indicate a great increase *of a ligneous or woody tissue*, which could only have been produced by the presence of *the unclouded sunbeam.*

How then stands the question between Scripture and Geology on this point? The fourth day is the period of the Creation represented by the formation of the Coal measures, the Carboniferous system of the geologist,—and we are now standing at the close of it, and on the confines of the Permian which succeeded it. Behind us lie the multitudinous forests and dense thickets of arborescent Ferns, and of that soft and succulent vegetation, which have been converted into the vast coal fields that are to be found in all latitudes of the globe; and which could not have been produced, had the Sun been visible from the Earth's surface;—before us lies the comparatively scanty vegetation of the Permian and succeeding formations, which present us with plants of ligneous tissue, that could not have been produced except under the influence of the direct rays of a visible sun. Can any thing more be required to establish the fact, that at this point of time in the Chronology of the Creation, the Sun, theretofore veiled by clouds from the Earth, shone out, and with the Moon and Stars appeared in the firmament of the heaven, thence-

forth, to "be for signs and for seasons, and for days and years."

So far Scripture and Geology concur in their testimony, that up to the commencement of the Permian system, the clouds above the firmament shut out the Sun from the Earth's surface. And here we may observe, that the phenomena of *central heat* confirm the same truth; for the tepid waters on the Globe's surface, at this early period of its existence, must have sent up a constant stream or volume of vapour, which rested above the atmosphere, until dissolved by the gradual cooling down of the elements. While such heat continued, that of the Sun must have been powerless; and those changes of climate, which are denominated the Seasons, could not then have existed. This gradual cooling of the Earth, and the consequent dissipation of the superincumbent clouds, was in operation throughout the Carboniferous era; at the end of which the Sun appeared in the heavens, and the alternating seasons commenced their career. This satisfies the terms of the divine decree, "Let them be for *signs and for seasons.*" And in confirmation of this, it is a remarkable fact, that season rings, the product of the sunbeam on the tree, have never been found in any of the fossil remains of the Carboniferous vegetation; but they have been discovered in some of the succeeding

systems; and in the Magnesian Limestone, one of the members of the Permian system, the heterocercal fishes, clad in that bony armour which was adapted for the tepid ocean of these early ages, disappear, and are succeeded by those horny-scaled tribes which have ever since peopled the cooled waters of the earth.

Besides the foregoing reasons, *the zoology* of the Carboniferous, compared with that of the Permian system, as brought to light by the geologist, furnishes us with further, and not less satisfactory, evidence, that the close of the former, and dawn of the latter, was the time of the first appearance of the celestial bodies to the Earth's surface. There can be little doubt but that Carbon must have impregnated the atmosphere, in these primeval ages, to an extent that must have been inimical to air-breathing animal life. Limestone is composed, one half of lime, and the other half of Carbonic acid gas, which must have been originally mixed with the atmosphere: and when we look at the vast masses of the limestone rock which now exist on the globe, and the greater proportion of which have been formed since the Carboniferous era, it is manifest that the enormous quantities of that gas, now represented by those rocks, must have been floating in the air during the growth of the coal vegetation, and aiding in its production. Now if, throughout

that period, the direct rays of the Sun were excluded from the surface of the earth, the effect would have been, as we have before stated, that the decomposition of the Carbonic acid gas would have been suspended, and the Oxygen, so necessary to physical life, would not have been exhaled; and without it, the air being impregnated with more of the Carbon than was consistent with the respiration of air-breathing animals, that class of creatures could not have existed; and geology furnishes us with the fact, that with the exception of a few Batrachians, no terrestrial animal had made its appearance on the earth previous to the Permian and succeeding systems. The Batrachian race are semi-icthyic, and form a connecting link between the Fish and the Saurian, or true Reptile; and as creatures of that description have been frequently found, in our own days, imbedded alive in rocks and clays, completely excluded from the air, their existence must be very independent of the state of the atmosphere. The appearance, therefore, of such a race of creatures without any other terrestrial associates, tends to confirm the fact of the air being still unfit for animal respiration. Such a state of the atmosphere could only be remedied by the increase of the luminous principle, by means of which the decomposition of the Carbonic acid gas would be

accelerated, and the Oxygen dismissed for the nourishment of animal life. The appearance, therefore, of air-breathing animals in the system which immediately succeeds the great vegetable era, with its scanty terrestrial zoology, will be evidence that the shade must have been removed by the dispersion of the superincumbent clouds; for if the existence and nature of the vast vegetation of the Carboniferous period, can only be accounted for by the continued absence of the direct rays of the Sun, by reason of which the atmosphere was charged with gases prejudicial to air-breathing animal life, the subsequent appearance of that class of creatures will prove that the clouds must in some way have been dispersed, and the atmosphere purified by the direct influence of the sunbeams.

Thus all the phenomena of the vegetable and animal existences of this era, which have been brought to light by the industry and research of the geologist, combine to confirm and establish the Scripture record, that after the submarine and vegetable creations of the Silurian, Devonian, and Carboniferous eras, the Sun, with its attendant host of Moon and Stars, till then veiled by clouds, sent forth, for the first time, its direct rays to the earth, to prepare the way for the higher class of terrestrial animals, by extracting the gases pre-

judicial to their life from the atmosphere, and diffusing those which sustain and invigorate. From henceforth, our earth presents a changed aspect. No longer covered in every part with tangled masses of vegetable matter, and a foliage of pale and sickly hue, it is now to become the abode of terrestrial animals of various forms and habits, and its diminished vegetation is, for the first time, to assume that garb of green, which accompanied the sunbeam[8], and has ever since been the distinguishing hue of the plants and herbage of the earth in all their varieties.

THE FIFTH DAY.

"AND GOD SAID, LET THE WATERS BRING FORTH ABUNDANTLY THE MOVING (CREEPING) CREATURE THAT HATH LIFE, AND FOWL THAT MAY FLY ABOVE THE EARTH IN THE OPEN FIRMAMENT OF HEAVEN. AND GOD CREATED GREAT WHALES, AND EVERY LIVING CREATURE THAT MOVETH, WHICH THE WATERS BROUGHT FORTH ABUNDANTLY, AFTER THEIR KIND, AND EVERY WINGED FOWL AFTER HIS KIND: AND GOD SAW THAT IT WAS GOOD. . . . AND EVENING WAS AND MORNING WAS, A FIFTH DAY."

The foregoing translation of this passage does not present to us the exact meaning of the original text; and the inaccuracy has had the effect of misleading the student of Scripture, with respect to the class of animals which were introduced on the stage of existence at this era of the Creation. The work of the fifth day, as thus described in our

[8] Ante, pp. 154, 155.

version of the Bible, is generally supposed to have included the creation of the exclusively submarine animals, besides that of the amphibious marine, and terrestrial Reptiles. But if our construction and explanation of the Mosaic narrative hitherto has been correct, the creation of the exclusively submarine animals, such as the Zoophytes, Mollusks, Crustaceans, and Fishes of the Silurian and Devonian strata, was commenced on the first, and completed on the third day. Consequently, the introduction of that class of creatures into the work of the fifth day, would be inconsistent and contradictory. But that no such consequence is to be apprehended, will appear at once from the following translation of the passage, which every Hebrew scholar will recognize to be critically correct.

"AND GOD SAID, LET THE WATERS SWARM FORTH (BRING FORTH ABUNDANTLY) *the reptile that hath the breath of life;* AND LET FOWL FLY OVER THE EARTH UPON THE FACE OF THE FIRMAMENT OF HEAVEN. THEN GOD CREATED *great sea monsters,* AND EVERY SOUL OF THE *creature that creepeth, which the waters swarmed out, after their kind,* AND *all flying of wing,* AFTER ITS KIND: AND GOD SAW THAT IT WAS GOOD[9]."

[9] The word (שֶׁרֶץ) which occurs in the 20th verse is translated in our version "the moving creature;" but according to Gesenius, it signifies "*a reptile.*" The word occurs in sixteen places in the Pentateuch, and in all of them, with the exception of Leviticus xi. 10, 11 (vid. Heb. orig.), it has been rendered in our version "creeping thing." In Lev. xi. 10, 11, it plainly designates an aquatic animal different from a fish having fins and scales. Ac-

Thus, the creation of this era emanated from the waters in great abundance; and that creation consisted of three classes of air-breathing animals, viz.—first, the great Sea Monsters—second, the Creeping things which the waters swarmed forth: though of aquatic habits, these were furnished with organs wherewith to creep or crawl upon the land—and third, the Winged creatures that soared above the earth.

Such are the recorded productions of the fifth day of the creation. Let us now search the Book of Nature, and we shall there find, that the race of animals which make their appearance, for the first time, in the Permian and Oolite systems, correspond exactly with those described by Moses. At these systems we have now arrived. The long ages, during which dark masses of unbroken clouds overspread the deep forests and dense foliage of the Carboniferous era, have passed away, and the gladdening sunbeams have, for the first time, saluted

cording to the same authority, the word (וִּשְׁרֶץ), which in the 21st verse is translated "the creature *that moveth*," ought to be rendered "*the creature that creepeth*." The same verb occurs in fourteen other passages of the Pentateuch; and in all of them it is translated so as to indicate a creeping motion. The expression in the 20th verse (נֶפֶשׁ חַיָּה) translated "creature that hath life," ought to be rendered "*the breath of life*." The word נֶפֶשׁ, according to Gesenius, signifies breath, being derived from the word "נָפַשׁ to breathe strongly, to pant."

the earth from the blue canopy of the open heavens: while the gigantic vegetation has sunk down into its recesses, to be disinterred only when the necessities of the still far distant race of intelligent beings, in the progress of civilization, shall require to use the hidden blessing laid up for them by a beneficent Providence, ages upon ages before their existence as part of the Creation. The first animal occupants of the dry land were obviously of the Reptile race. This is a fact established beyond dispute, and admitted by all geologists. The traces of a few Batrachians are found in the Carboniferous system; but creatures of that class are only semi-reptiles, entering into life in the form of fishes. The true reptiles are of the Saurian or Lizard tribe, whose earliest organic remains are found in the Magnesian Limestone, a member of the Permian system. But ascending a little higher, to the next series of strata, the Oolite, we find that, as described by Moses, they swarmed forth in such astonishing abundance, that the era, represented by the deposition of this formation, has been termed by geologists "the Age of Reptiles." It is here, therefore, that we are to search for the confirmation of the Mosaic Record, that they were *vast and abundant*—and what do we find?

Our first witnesses of the truth of what has been written, are the huge *Elaniosauria*—the Icthyo-

sauri and Plesiosauri, with other marine Reptiles of the same class, which have been already described, and whose forms were peculiarly adapted for an aquatic life, though, from their organic remains, it is obvious that they were air-breathing oviparous Reptiles. These all appear in vast abundance, for the first time, in the Permian and Oolite systems; and in them we have no difficulty in recognizing the Mosaic הַתַּנִּינִם, or "*great sea monsters.*"

Our next witnesses are the *Dinosauria*, or gigantic Terrestrial Saurians, of which we have already pourtrayed the Megalosaurus and Iguanodon as specimens of the class. Their organic remains are found, for the first time, in the same systems; and they are "*the creeping things which the waters swarmed out,*" as described in the Scripture Record.

Lastly—in these systems also, we behold, for the first time, the fossil remains of the various species of *Pterosauria*, or Pterodactyles, those strange lizard forms, which were provided with wings wherewith "*to fly over the earth, upon the face of the firmament of heaven.*" And in the New Red Sandstone, one of the Permian strata, we also find the first traces of the feathered tribes, (some of them, like their Saurian contemporaries, of extraordinary stature,) in the footprints impressed

on the soft mud and sand on which they stalked; and which, converted into stone, have been preserved through long ages, as further witnesses of the truth of the Mosaic statement, that at this period God created "*the flying of wing* after its kind." What can be more interesting than evidence of this nature. Sand, the sport of every breeze and wave that sweeps over it, has ever been considered the type of all that is fleeting and unstable. An impression on the sand, has been commonly used as a figure of speech, to indicate the most evanescent of earthly things—a building on the sand, the most feeble and unsteady; and yet, in the footprints of an animal impressed on the sea-shore ages upon ages before the dawn of the human era, we are permitted, by the goodness of the Almighty, to read an imperishable testimony to the truth and inspiration of his revealed word to man.

All these Saurian Reptiles—Elaniosauria, Dinosauria, and Pterosauria or Pterodactyles—resemble the race of Birds, which were introduced in association with them into the Creation, in one particular, viz. that they were all of them *oviparous*, generating their species through the medium of eggs. This is the type, or distinguishing characteristic, of the whole class of the air-breathing creatures which now became the first, and continued for long

ages to be the sole, occupants of the dry land. This period of the world's history might therefore, with propriety, be termed the oviparous, or egg-bearing animal era. What more can be required to vindicate and establish the truth and accuracy of the written Record? Three classes of animals, *air-breathing*, but proceeding from the waters, and therefore more or less aquatic in their origin and habits, are described by Moses as the creation of this era—*great sea monsters—creeping animals from the waters—and winged creatures:* and the Record of the Rocks exposes to our view, the first of these, in the organic remains of the huge Elaniosauria—the second, in those of the still more gigantic Dinosauria—and the third, in the fossilized Pterodactyles, and the footprints of the Birds in the New Red Sandstone formation. All is consistency, for all is truth.

It is worthy of observation, that none of the wondrous scenes of the primeval world have more particularly attracted the notice of geologists, than that which the earth presented during the days of the deposition of the Lias and Oolite. The extraordinary abundance, and vast dimensions, of the Reptile population of that era have been the favourite theme of wonder and speculation to all geologists; and it is no less remarkable, that the only portion of the creation, as recorded by Moses, in which he

gives any intimation respecting the size or extent of the created animals, is that of the fifth day; where he states, that the creeping things were brought forth "ABUNDANTLY," and that there were "GREAT sea monsters." If the scenery of the Lias and Oolite had been exhibited to his sight (as we say it was), all geologists must agree that he would have beheld the Earth, Sea, and Air swarming with multitudes of gigantic Saurian Lizards, which could not have failed to strike him with an astonishment, that would, in all probability, have found utterance in the peculiar language of that part of his narrative. *The number and size* of the Reptile race are the features of the era of the Lias and Oolite, on which the Geologist dwells —"*Abundant*" and "*Great*" are the epithets applied by Moses to the creeping things of the fifth day or era of the Creation. Is not this some confirmation of the identity of the two scenes— some evidence, that Moses has described what the geologist has brought to light of this remarkable epoch, "the Age of Reptiles?"

The forms of these strange first-born of terrestrial creatures, reconstructed and restored by the research and skill of the comparative anatomist, may be seen in the grounds of the Crystal Palace at Sydenham; where the student of Scripture may realize to himself the varied shapes and vast di-

mensions of these Monarchs of the Earth, Sea, and Air, in the days of their abundance; when human reason and responsibility were unknown within the precincts of our globe, and no creature of an organization higher than their own was in existence, to dispute their supremacy. Let him compare these stupendous beings with the Scriptural description of those created on the fifth day, and he cannot fail to recognize, in their strange and varied forms, the great sea monsters, the creeping things which the waters brought forth, and the flying of wing, of which Moses spake in the first chapter of Genesis.

This era of the fifth day extended from the commencement of the Permian to the close of the Oolite, or beginning of the Chalk formation, in which we find the first specimen of terrestrial Mammalia, in the form of the Marsupial, which is a connecting link between the Reptile and the Mammal. It was indeed a remarkable era; and not the less so, because of the, comparatively speaking, early disappearance of these huge tyrants of the then Creation in the Cretaceous system; and they are now represented by the scanty family of the Crocodiles, Iguanas, and Lizards of our own era—degenerate descendants of such ancient, numerous, and gigantic ancestors.

THE SIXTH DAY.

"AND GOD SAID, LET THE EARTH BRING FORTH THE LIVING CREATURES AFTER HIS KIND, CATTLE, AND CREEPING THING, AND BEAST OF THE EARTH AFTER HIS KIND: AND IT WAS SO. AND GOD MADE THE BEAST OF THE EARTH AFTER HIS KIND, AND CATTLE AFTER THEIR KIND, AND EVERY THING THAT CREEPETH UPON THE EARTH AFTER HIS KIND: AND GOD SAW THAT IT WAS GOOD."

The creatures here enumerated as the creation of the sixth day, are the Beasts of the forest, the Cattle of the hills, and the Creeping things of *the earth*; all of the Mammal race, and distinguished from the previous oviparous members of the Creation by the peculiarity of procreating their species by uterine gestation. The simple record of Moses is, that the quadruped Mammalia came into existence after the epoch of the oviparous Reptiles; and nothing can be more conclusive than the testimony of geology, that such were the facts as they actually occurred in the progress of creation. Whether we assume that the creation of the Mammalia commenced with the appearance of the half-reptile Marsupial at the close of the Oolite, or whether we assume that it commenced with the Pachydermata of the Eocene, the era of the Mammal succeeded that of the oviparous Reptile races; and the Scripture narrative is truth.

For a long series of ages, represented by the formation of the Tertiary deposits, the quadruped

Mammal reigned supreme in the Creation, until another creature of the same class of physical organization, but immeasurably superior, and distinguished by reason and responsibility,—qualities till then unknown in created beings on our planet,—came into existence. This event is announced in the Mosaic narrative as part of the Creator's work on the sixth day.

"AND GOD SAID, LET US MAKE MAN IN OUR IMAGE, AFTER OUR LIKENESS; AND LET THEM HAVE DOMINION OVER THE FISH OF THE SEA, AND OVER THE FOWL OF THE AIR, AND OVER THE CATTLE, AND OVER ALL THE EARTH, AND OVER EVERY CREEPING THING THAT CREEPETH UPON THE EARTH. SO GOD CREATED MAN IN HIS OWN IMAGE, IN THE IMAGE OF GOD CREATED HE HIM; MALE AND FEMALE CREATED HE THEM. AND GOD BLESSED THEM, AND GOD SAID UNTO THEM, BE FRUITFUL, AND MULTIPLY, AND REPLENISH THE EARTH, AND SUBDUE IT: AND HAVE DOMINION OVER THE FISH OF THE SEA, AND OVER THE FOWL OF THE AIR, AND OVER EVERY LIVING THING THAT MOVETH UPON THE EARTH."

In this record of Man's creation, there are two cardinal facts stated, which are capable of receiving confirmation from the contents of the Book of Nature. First, that the human race was the last created of the animal kingdom; and second, that the whole human family descended from a single pair of ancestors.

As to the first of these propositions, we have already seen, that there is no truth in the wide field of nature, which rests on a more sure and satisfactory foundation, than that Man was the last item in

the progressive scale of created beings. In this the Geologist and the Religionist concur. Whether we consider his moral and intellectual status, or his physical structure and organization, he manifestly and distinctly stands on the highest of the ascending steps of that creation, which commenced with the humble Zoophyte, and has advanced upwards through the expanding, but perfectly distinct, organizations of the Mollusk, Crustacean, Reptile, and quadruped Mammal; and it is obvious that, in the divine plan, thus manifested and exemplified, Man's proper station ought to be exactly where Scripture and Geological facts have placed him. Not a particle or trace of the human form,—not a record or vestige of any work of art, is to be found in the stratified deposits, in which are embedded the organic remains of all the previous races of animals: and therefore, all these orders of animated nature were in existence ages before the breath of life was breathed into his earth-formed frame, and lordship over the existing creation was conferred upon him. Had any creature in the likeness of Adam trod the earth during the deposition of the stratified deposits, his form and works must have been traced in as legible characters on the framework of our globe, as the forms of those plants and animals which have been exhumed in such abundance by the practical Geologist.

Thus, we are furnished with evidence which, though negative, is most conclusive, that the several families of the creation, comprised in the Mosaic and Geological catalogues, were in existence before the formation of one of the human species. This crowning event was the last and greatest of all. Scripture chronology fixes the date of it to have been about six thousand years anterior to the present time; and there is nothing in the aspect of nature in general, or of Man in particular, to lead us to think that this date is not substantially correct. History and tradition, ancient monuments and records, tell us of a time when whole continents were unpeopled, or nearly so; and of a progress of population, arts, sciences, and civilization over most parts of the globe, which is in perfect harmony and consistency with the Scripture account of the origin and descent of the human race from a single pair of ancestors. Capacity of progress is the distinguishing characteristic of Man; and, had his species been in existence even at so comparatively recent a period as the Pleiocene, the last of the stratified deposits, every corner of the globe must have been crowded with evidences of his physical and mental powers, myriads of years before the Mosaic date of his existence. All the luxuries and ornaments of civilized life,—the arts and sciences, which are the

natural offspring of the human mind when brought into contact with the physical world, must have attained their perfection ages ago, and left imperishable records of states of society, equal or superior to those of the most civilized nations of the world of the present day. This is the argument conveyed by the well-known lines of Lucretius,

> "Si nulla fuit genitalis origo
> Terrarum et cœli, semperque æterna fuit,
> Cur, supra bellum Thebanum et funera Trojæ
> Non alias alii quoque res cecinere poetæ."

This evidence, though not demonstrative in its nature, like the facts of Geology, is nevertheless most satisfactory and convincing, when adduced in confirmation of what is stated in Revelation, and consistent with the stony legends, that the human race came into existence within the last six thousand years.

Second; all mankind have sprung from a single pair of ancestors. This community of origin necessarily involves the question of the unity of the human species, a subject on which there has been a considerable diversity of opinion, and much discussion among naturalists. That there are varieties of the race, as they at present exist on the earth, is obvious. The inhabitants of some countries differ from those of others, not only in

language, demeanour, and habits, but in shape and colour; and have, in consequence, been divided by some Ethnologists into five, and by others into seven, races; but it is admitted, that there are some members of the human family which cannot be included in either of these classifications. These diversities have been supposed by some to be characteristic of distinctness of species; but the best informed of those philosophers who have studied the subject, concur in the opinion that they are only varieties of a single species, and that between the groups thus formed, no true typical distinction can be recognized. They are only varieties, and not species, which would imply separate primary ancestors. The colour of the skin, and the form of the skull and pelvis, are the principal features of diversity; and these, according to Blumenbach, Prichard, Humboldt, and others who rank high in this department of physical knowledge, are such as may be referred to, and satisfactorily accounted for by, external circumstances, such as climate, soil, food, mode of life, artificial treatment continued through long periods of time, and other causes which may yet be discovered.

The character and structure of languages, also, and the identity of the inward and mental nature that is to be recognized in all the races of mankind,

entitle us, according to Dr. Prichard, "to draw confidently the conclusion that all human races are of one species and one family."

Thus the Archaic record of the origin of Man, the final and completing work of the creation, is fully confirmed by the information and instruction contributed by history, tradition, experience, and science to the stock of human knowledge. Geology informs us, in confirmation of the written Word, that there was a time, and that too of comparatively recent date, at which none of Adam's race were to be found within the precincts of our planet, while all the other races of animals were its inhabitants. And physiology, history, and experience teach us also, in confirmation of Scripture, that all the different races of the human family, now spread over the face of the Globe, have descended from a single pair of ancestors.

But Man was to have "dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the Earth." All these classes of the animal kingdom, with the herbs and trees of the vegetable creation for his use and sustenance, surrounded him on his entry into existence. Zoophytes, Mollusks, Crustaceans, and Fishes tenanted the waters. But the Zoophyte, Mollusk, Crustacean, and Fish of the Silurian and Devonian eras, are not identical with

those of the human era. None of the more ancient species are now in existence. The various changes which the Earth and the Waters have undergone, have operated through the long intervening succession of ages, in so altering and modifying their natures and habits, that none of the original species are now to be found. Varieties of temperature and atmosphere, soil and climate, means of subsistence, and other surrounding circumstances, which the slow progress of long ages brought in its train, must, within certain limits, have caused important corresponding changes in the animals and plants exposed to their influence — such animals and plants having a natural tendency, as experience testifies, to adapt themselves to their varying positions and circumstances. For instance, the first Mollusks which geology presents to us, were clad in horny shells, by reason of their lot having been cast in the muddy oceans of the Lower Silurian system, which were devoid of lime for the secretions of calcareous shells. When lime became more abundant, this same class of animals formed for themselves shells of that substance, which transferred them to a different position in their order. Again, the high temperature of the primeval waters must have had a considerable influence on their inhabitants. The species of the first fishes, the Placoids and Ganoids of the Devo-

nian and Carboniferous eras, were, as we have seen, clad in osseous coats of mail, calculated, as it has been suggested, for creatures destined to live in tepid waters; and when, in process of time, the temperature had cooled down, this bony armour and its invariable accompaniment, the hetero-cercal tail, fade away, and are succeeded by the horny scales and homo-cercal tail of the Cycloid and Ctenoid families, which, though in altered forms, exist to the present day. The same may be said of the Reptile and Mammal races, many of which have died out, and others have become altered by similar adaptations to surrounding circumstances. The mighty Saurians of the Lias and Oolite have disappeared; and the gigantic Mammals of the Tertiary era have dwindled down to the, comparatively speaking, pigmy quadrupeds of our own times.

But still, all these variations take place within certain limits; for no change of circumstances could operate to convert an animal of one class into one of another; for instance, an herbivorous into a carnivorous creature, much less a Mollusk into a Fish, a Fish into a Reptile, a Reptile into a Bird, or a Bird into a Mammal. They were all formed by the Almighty on peculiar and defined models, "*each after its kind*;" and have been preserved separate and distinct under all the varying

circumstances of the external world. But though the Zoophyte, Mollusk, and Crustacean of the human era, are different in form and habits from those of the Silurian, they are nevertheless their lineal descendants in the sense of parent and offspring. In like manner, the Reptiles, Birds, and Mammals, which are the associates of Man, have all descended from the first created of their kind, as our contemporary fellow-men are all of them descendants of their common progenitor, Adam. Thus, created beings, in proportion as they are low in organization, are high as regards the antiquity of their races; and in comparison with all the other orders of the animal kingdom, Man is but a parvenu, a creature of yesterday. Each of the leading associate classes of the creation were in succession the Monarchs of the world, before that the first of his race had appeared upon the Earth.

This is the true relationship and connexion which exists between the former and present races of the animal and vegetable creation, and is consistent alike with Geology and Scripture. Very different is the development or transmutation theory, which was first propounded by La Marck and De Maillet, French zoologists, and which has been lately revived by the author of "The Vestiges of the Natural History of Creation." Their theory is, that organic life commenced in the lowest and

most simple forms, and being endued with an inherent property of progressive improvement, it has advanced by the operation of pre-ordained natural laws, from the inferior to the superior orders of beings, without any interference on the part of the Deity, or any exercise of his immediately superintending power in the mundane economy. According to those philosophers, this law is, not only the tendency, which we observe in the various species of the animal and vegetable creation, to adapt themselves to surrounding circumstances at successive periods of time, but a tendency to provide themselves with organs to supply certain wants and desires imprinted in their natures; so that "organization is the result of function, and not function of organization." And under the influence of this so-called law, and independent of all creative interference, the Zoophyte has expanded into the Crustacean, the Crustacean into the Fish, the Fish into the Reptile, the Reptile into the Bird, the Bird into the Mammal, and the Mammal into Man. In like manner, the noblest tree of the human era, has, it is said, derived its origin from the lowliest Fucoids and Algæ of the primeval waters.

Thus, according to these theorists, the lineage of Man is naturally and progressively derived, without the interposition of God, from the humblest

forms of animal life. The Zoophyte was one of his remotest ancestors; and the Mollusk, Crustacean, Fish, Reptile, Bird, and Mammal figure as blood-relations in his pedigree; while the Frog and the Monkey are stated to have been his more immediate progenitors[1]. Ludicrous and absurd as this may appear, it is no misrepresentation of the development system. Nor is the case mended, when we enter into the particulars of these strange transmutations, and read the grave suggestions of some of these theorists, that the Fish, by an attempt, or conatus, as it is termed, to invade the land, became in some unaccountable manner, furnished with the legs, feet, and other appendages of a terrestrial animal; and by a conatus to fly, found himself, by some equally surprising freak of

[1] In tracing the pedigree of Man, the development philosophers seem to consider that the Frog has better pretensions than the Monkey to be installed as the direct ancestor of the human species, on the ground that it is the only animal besides Man that is furnished *with a calf to its leg.* The proposition is thus stated by the Author of "The Vestiges." "It may here be observed, that of all the Reptilian orders, the Batrachian is that which has best pretensions to a place in the origin of the Primates. 'It is singular,' says Dr. Roget, 'that the Frog, though so low in the scale of vertebrated animals, should bear a striking resemblance to the human conformation in its organs of progressive motion.' It is the only animal besides Man with a calf to its leg. 'It evidently is making,' says Dr. Roget, 'an approximation to the higher orders of Mammalia.'"—The Vestiges of the Natural History of Creation, p. 196, 6th ed.

his nature, covered with feathers. These are the suggestions of La Marck and De Maillet. It must, however, be admitted that the more recent expounders and patrons of this theory do not follow out their speculations to the same extent, by entering into the minutiæ of the mode of transmutation from one species to another; but, without committing themselves to details, they do insist that the various races of animals and plants have resulted from transmutations, under the influence of prearranged laws of Nature, without any exercise of creative power, or any special interposition of the Deity.

The question is between an original adjustment by the Almighty and the continual interposition of the Almighty—between those who deny, and those who maintain, a special guiding and directing Providence in the operations and course of the physical world. The processes of nature are uniform and regular, and *uniformity and regularity* are the attributes of a wise, good, and merciful God, and as such, ought to attest his presence. But because they do exist in all the operations of the physical world, and because there are no symptoms of inconsistency or caprice in its government, these philosophers of the development school deny his presence altogether, and assimilate the course of nature to the movements of a well-adjusted ma-

chine, which progresses with independent action. Cold and insensate philosophy this, which, rejecting revelation, affects that it is more easy to conceive an universe, such as ours, in operation like lifeless machinery, than to comprehend it as being under the guidance and direction of an omniscient and omnipresent Creator; and commits unreasonably to Nature's laws that which belongs to Nature's God alone.

> "The Lord of all, Himself through all diffused,
> Sustains, and is the life of all that lives.
> Nature is but the name for an effect,
> Whose cause is God."

Materialism was the avowed creed of those, with whom these doctrines originated; and their rejection of an intelligent First Cause was, it must be conceded, more consistent with such principles, than the avowal by their more recent supporters of their belief in a supreme author of the universe: for, while the latter admit that there must have been a Creator, they cautiously abstain from any definition of what it is that He has created, and confess that philosophy cannot determine the beginning of physical causes, or define the created entities from which all others have been developed. Lamarck speaks of something which he styles "*monads*," as being the only things to which Nature gives birth directly. Oken observes, that

"no organism has been created of larger size than the *infusorial point*, which is microscopic: all larger forms are developed, not created"—and no other author seems to have suggested any thing more definite on the subject. But whether these alleged rudiments of organized forms are styled "monads," or "infusorial points," their existence and origin are admittedly mere conjecture, and, as such, amount to confessions of an ignorance of matters beyond the province of reason, which could only be removed by a revelation from the Most High, to lead us into the knowledge of that relationship which exists between the Creator and the created.

Nevertheless, the development philosophers of the present day do concede that an universe without a divine author is inconceivable: and we may add, that if the existence of a mundane system necessarily involves that of a Creator, its continuance in a state of order as necessarily implies his guiding hand and controlling power. As a metaphysical proposition, the one is as self-evident and convincing to an intelligent mind as the other. To these dreamers, the creation of monads or infusorial points, which, by their own inherent powers, produce all the complex organic structures of the animate and inanimate world, presents no difficulty; but statements that the Creator continues to clothe the lilies of the field, and to number

the hairs of the head, are treated by them as fictions, or figures of speech—and yet they are simple truths by which the omnipotence, omniscience, and omnipresence of the Almighty are presented and realized to the believer's mind; qualities which can have no existence or meaning, if the principles of the development theorists are true.

Such is the theory of progressive development, which, admitting the existence of God, excludes Him from all immediate superintendence over the affairs of the world which He has created and furnished; and by degrading man to the level of the brutes that perish, deprives his soul of all claim to immortality. But for these consequences, so strangely welcome to many a human heart living in a state of resistance to God, this fanciful dogma must have been long since discarded by all reasoning minds, as one of those amusing conceits which are frequently the offspring of perverted learning and misapplied research. It receives no countenance from geology or any other science, and is wholly inconsistent with revelation. Among the vast quantities of the fossil remains of every class of animal, no specimen has been discovered which could be taken to indicate such a transition from one race or order of those creatures to another; and each *after its own kind* is as perfect on its

first appearance, and generally speaking more so, than at any after period. For instance, the first fishes of the Devonian system are more complete and elaborate in their organization and structure than any of their successors; and the changes which have taken place in this, as in every other class of the animal creation, indicate a degradation of race rather than a progression. The Zoophytes, Mollusks, and Crustaceans of the Silurian age, and the Placoid and Ganoid vertebrates of the Devonian, are superior in organization to any that have since occupied the waters of the globe. The first Saurian reptiles of the Lias and Oolite were giants, which have never been paralleled by any of their race in after-ages; and the Mammals of later times are but pigmies, when compared with the colossal Megatheria, Mammoths, and Mastodons of the Tertiaries. There is nothing, therefore, in geology, when rightly understood, which supports the theory of development.

Leaning on God's word, and reading the written and the stony records together, we are preserved from all such whimsical reveries and dangerous speculations. We find in the Book of Nature, as far as we have been able to decipher it, that organic life began with the Zoophyte, and then appeared, at successive periods, in the advancing orders of the invertebrate and vertebrate animal

kingdom up to Man; but appealing to the written record, we find, that at the different stages of the creation of such of these orders as are there noticed, the God who had made the Heaven and the Earth in the beginning, uttered his fiat for the birth of *each of them after its kind*, and Nature responded—thus interposing, and preserving to each of the respective orders of the animal kingdom, its own distinct and separate origin and lineage. If, therefore, the Mosaic narrative be true, the continued active interposition of the Creator in the production of the several items of the creation is established, and the theory of development or transmutation by natural law is at an end.

How necessary, then, is it for the cause of revelation that the identity of the two Records should be established—more especially, when we find that on their presumed inconsistency, the advocate of the development theory has attempted to get rid of the Scriptural argument against it. The Rev. Baden Powell, a Professor in the University of Oxford, after observing on, what he terms, "the irreconcileable contradiction between the whole view opened to us by Geology, and the narrative of the Creation in the Hebrew Scriptures, whether as briefly delivered from Sinai, or as expanded in Genesis," and that "in the minds of *all competently*

informed persons at the present day, after a long struggle for existence, the literal belief in the Judaical cosmogony, it may now be said, has died a natural death," proceeds to reason in favour of the development theory as opposed to revelation; and observes, that "those who accept geological truths at all, and admit the *palpable contradiction* to the Old Testament without prejudice to their faith, cannot with *consistency* make it a ground of objection to any hypothesis of the *nature* of the changes indicated, that they are *contrary to Scripture. They are no more so than all Geology is*[8]."

When we find a learned Professor thus upholding a doctrine which excludes the active disposing and guiding presence of the Deity from the world and its inhabitants, by pouring contempt on his written word, it is time for the believer to inquire whether there is truth in his suggestion, that there is an irreconcileable contradiction between Geology and Scripture. Let the foregoing pages decide if the literal belief in the Judaical cosmogony has died a natural death. So far from such being the fact, we assert with confidence, that every class of being which has lived on the Earth, or stirred in the waters of the Globe, since time began, proclaim from their stony sepulchres, in language that

[8] The Unity of Worlds, pp. 457. 460.

no Sceptic can contradict, that the cosmogony of Moses and the cosmogony of Nature are identical; and that the Creator alone could have communicated the Scripture record to his inspired servant. And if inspiration guided the pen of Moses, it is not for Man to reject what God has revealed, in order to uphold a theory that is not countenanced by any of the phenomena of nature, and which is contradicted by the written word, that "in Him, and to Him, and through Him are all things."

CHAPTER V.

THE INSPIRATION OF THE MOSAIC RECORD.

"The world's a prophecy of worlds to come."—YOUNG.

WE have now unfolded and compared, step by step, and line by line, our two records of the Creation; and not only have they proved consistent throughout, but they fully confirm, corroborate, and mutually elucidate and explain each other. We have accompanied the Geologist through the creations, and we have dwelt with him among the creatures, of the pre-Adamite world. With him, we have been present on our planet when it was a dark and lifeless mass; and with him, we have witnessed the first glimmer of life and light that dawned upon the watery globe. With him, we have explored the shoreless ocean of the Silurian ages, and its population of submarine invertebrates, when the highest specimen of creative power was a lowly Crustacean. With him, we have seen the first speck of land that

arose from the world of waters when the Silurian closed, and the Devonian system began; and with him, we have penetrated and surveyed the mighty and many successive forests which clothed the earth, and supplied the vast coal deposits, of the Carboniferous era. With him, we have gazed upon the giant reptiles of the Lias and Oolite, and the colossal birds which have left their footprints in the Permian sandstone—sole tenants of the land for unnumbered ages; and with him, we have seen these monarchs of their time decay, and their kingdom given to another and a higher order of beings, the Mammal races, which succeeded them in the Tertiary period of our planet's history.

Strange scenes were these; and strange it is, that, after the many revolutions and convulsions which for countless ages have swept over and through these cemeteries of bygone creations, they should be reproduced by the Geologist for our contemplation and instruction, on whom the ends of the world are come. In each and all of them, we have been presented with unerring testimonies of the faithfulness and accuracy of the divine historian's report of the nature and order of the work of the Almighty, in his process of forming and fashioning the Earth and all that therein is; and thus the phenomena of geology, instead of dis-

proving the Record of Moses, are found to form a series of golden links which connect the God of nature with the God of revelation. A short retrospect will confirm this important fact.

From Scripture we learn, that "in the beginning God created the Heaven and the Earth, and that the Earth was without form and void (invisible and unfurnished), and darkness was upon the face of the deep." From Geology we know, that there was a period in the ceaseless flow of time, when the Earth, which is now clothed with verdure and throbs with animated nature, was a watery waste, devoid of physical life, and enveloped with muddy vapours which shut out the rays of light from its surface.

From Scripture we learn, that while darkness was yet on the face of the deep, the creative Spirit of God brooded on the waters, and life preceded light. By Geology we are taught, that the Spirit of the Creator terminated the lifeless state of our planet in the next succeeding period of time, by pouring submarine life into the expanse of the primeval ocean; and that the earliest created specimens of physical life, the Graptolites and Lingulæ of the lower Silurian system, were devoid of organs adapted to the perception of light—thus leading to the conclusion that, in accordance with

the Mosaic narrative, light had not dawned upon the globe when life first stirred in the waters that encircled it.

From Scripture we learn, that by the Almighty fiat light was then let in upon the Globe. Geology presents to us the next immediately succeeding class of created beings, the univalve Cephalopods, the Trilobites, and other Crustaceans of the Silurian system, furnished with organs of vision; thereby attesting the advent and presence of the luminous principle.

From Scripture we learn, that on the second day the Atmosphere was formed, and that a canopy of clouds was suspended above the firmament, veiling the heavenly host of Sun, Moon, and Stars from the face of the Globe; that afterwards, on the third day, dry land and land vegetation appeared; and finally, on the fourth day, the canopy of clouds being dissolved, the heavenly bodies were for the first time disclosed, to be from thenceforth "for signs, and for seasons, and for days, and for years." From Geology we know, that at the close of the Silurian submarine creation, vast mountains were upheaved by volcanic forces from the deep, and land vegetation made its first appearance, attesting the previous existence of an atmosphere; and from the same source, disclosing to us the mineral contents of the great coal mea-

sures, we know that the nature, quantity, and quality of the vegetation which then sprang up, were such as demonstrate the growth to have taken place under circumstances indicative of *long continued shade*, which must at last have been dispelled by the dispersion of the superincumbent clouds, and the admission of the direct rays of the Sun to the Earth's surface. Thus, both of our Records concur in testifying that the order of creation was—a clouded atmosphere, dry land and its vegetation, succeeded by the direct and unimpeded radiance of the Sun, Moon, and Stars.

From Scripture we learn, that the next display of creative power was an abundance of great sea monsters, terrestrial reptiles, and winged creatures; and Geology exposes to our view, in the next succeeding strata, the organic remains of the then existing tenants of the ocean, the land, and the air; and we behold profuse swarms of the gigantic Saurians which peopled the earth in "the age of Reptiles"—Elaniosauria, tyrants of the deep; Dinosauria, tenants of the land; and Pterodactyles and feathered Birds, the flying of wing through the firmament above the earth.

From Scripture we learn, that the next step was the creation of cattle, and creeping things, and beasts of the Earth (the Mammalia). From Geology we know, that the race of quadruped

Mammals did not come into existence until after the age of Reptiles; that the Saurian monsters, with the other oviparous Reptiles and Birds, had been tenants of our globe for ages before we find the traces of a quadruped Mammal.

Lastly, from Scripture we learn, that the closing and completing work of the Creation was Man; and Geology triumphantly confirms the revealed fact, that submarine animals, land vegetation, Reptiles, Birds, and quadruped Mammals, were all of them in existence, successively and collectively, ages before the first of the human race.

Thus the Record of Moses and Nature's Record are found to be consistent in every particular; and, so far from exhibiting contradictions, or even discrepancies, they sound the same note, and harmonize in every line of their wondrous hymn of glory and praise to the great Creator and Lord of all.

This coincidence between the narrative and the events cannot be deemed to have been casual. The mind of the writer must, therefore, have been supplied with an accurate knowledge of the facts he has chronicled, which could only have been derived from the ordinary sources of human knowledge, or from some supernatural communication. If his information was acquired from a natural source, he must have been, not only acquainted

with all the phenomena of Geology, but his acquirements in Mineralogy, Zoology, Botany, and Chemistry, must have been extensive and accurate. He must have been familiar with the several successive revolutions through which the mass of our planet has passed, and the phases which her surface has presented since she first appeared in the form of an igneous globe; and must have known that after the igneous age a watery epoch ensued, when she was girded with a shoreless ocean, and her sole inhabitants were tenants of the deep. He must have known that this watery period was succeeded by a great woody or vegetable era, which was followed by the successive ages of vast and abundant reptiles, of mammals, and lastly, of the human race. He must have known that though light had appeared on the first day of the Creation, the visible orbs of the Sun, Moon, and Stars were veiled, through a vast lapse of time, by clouds, until the close of the great woody era; and for this, it was necessary, that he should have been acquainted with the existence of the coal mines and their vegetable contents, and the nature and effect of the sunbeam on vegetation and the atmosphere. All this knowledge, at the least, must have been present to the mind of the writer of the Mosaic narrative, if he wrote not under the inspiration and direct dictation of the Most High.

Moses was learned in all the wisdom of the Egyptians; but who will venture to suggest that the foregoing items of knowledge were comprehended in the lore of that ancient people, upwards of three thousand years ago. And even if Moses had possessed such knowledge, who will say, that, under the guidance of mere human wisdom, he could have traced so concise and condensed an epitome of the progress of the formation of the world and its inhabitants—more especially, when we recollect, that the wisest and best of our modern philosophers, furnished with all the knowledge which science and research have been accumulating for centuries, have not, to the present hour, recognized the Mosaic narrative to be, what it is, a synopsis of the vast events which they and their predecessors, without any reference to Scripture, have been learning and arranging from the stony leaves of Nature's book.

Here is evidence of divine inspiration, more satisfactory and conclusive in its nature than even that which is to be derived from fulfilled prophecy. The buried palaces of Nineveh, the lone wilderness of Idumea, the barren wastes of Palestine, and the scattered race of Abraham, dwelling amid the nations of the world, and yet alone, separate and distinct from all, are fulfilled prophecies, and tes-

tify of the inspiration of the holy men of old, who described these scenes, as they now are, long before the descent from their proud prosperities had commenced. But Nature's treasury supplies other witnesses which attest, with more conviction to the human mind, the divine origin of God's word. The lifeless Cambrian system tells us, that there was a time when "the Earth was without form and void." The Silurian testifies that then the creative Spirit of God moved in the waters, and light dawned; the Devonian, that after another lapse of time, land and land vegetation arose from the deep; the Carboniferous, that the Sun appeared not to an earthly eye until its close; the Permian, Lias, and Oolite, that the Saurian great sea and land reptiles, and the flying of wing were then ushered into being; and the Cretaceous and Tertiaries, that beasts and cattle succeeded, and peopled the earth for ages before that Man, the last of all God's creatures, stepped forth, in his Maker's image, on the earth prepared for his habitation. This cloud of witnesses of the truth of the Scripture record was unknown to Moses, who penned it. To himself, the generations of men which preceded, and those which succeeded him for three thousand years, these leaves of Nature's book were sealed and silent; and yet, from these alone, if not

directly revealed by God, could the knowledge of the pre-Adamite world, which the writer of the Mosaic narrative possessed, have proceeded.

This evidence of the inspiration of Holy Writ is manifestly of a higher order than any which has been supplied by fulfilled prophecy. We can conceive it to be *possible*, that experience of the past, combined with an extensive and correct knowledge of the present, might supply to a sagacious mind, arguing from analogy, information as to the future sufficient to account for a successful prophecy. On the principle declared by Solomon, "the thing that hath been, it is that which shall be; and that which is done, is that which shall be done," the Sceptic has resisted the evidence of inspiration which is derived from fulfilled prophecy. The argument is intelligible, though to an unprejudiced mind, the principle is wholly inadequate to account for the strange correspondence which is found, in most instances, to exist between the prediction and the fulfilment. But, as respects the history and detail of the past scenes, which occurred before the existence of man upon the earth, the evidence of which was buried and hidden from the sight of Moses and his contemporaries, who had nothing analogous to suggest the materials on which their reasoning and reflective powers could act, how is it possible to conceive, that without some super-

natural communication, he should have produced any, much less a correct, record of the nature and order of the events of the pre-Adamite world?

It has always been a favourite dogma of the Sceptic, but adopted and justified of late by some who call themselves Christians, that the inspiration of the Prophets and Apostles differs in nothing from that which influenced the mind, and guided the pen, of a Newton, a Milton, or any of the other master intellects of the world—meaning thereby, that all which the Prophets foretold, and all that the Apostles have taught, were the offspring of unaided human intellect combining and arranging the materials which were supplied by sense and experience; and that thus holy men of old taught, not by the dictation of God's Spirit, but under the guidance of their own unassisted reasoning powers. However plausible may be the arguments which have been advanced in support of this theory, when applied to the case of the Prophets and Apostles, they are wholly unmeaning and inapplicable when we come to deal with the inspiration of onewho wrote, as Moses did, of things to which he was an utter stranger, and of which, except by a divine communication, he had no more knowledge than he had of the planetary system, the powers of steam, or the marvels of electricity.

If it could be shown that Newton had, without

any previous knowledge of even the rudiments of physical astronomy, depicted the Solar system as he has done, and described the laws by which the planets and their satellites are retained in their respective orbits, their size, and the periods of their revolutions, even though many of these cosmical bodies had not been disclosed, at the time, to the eye of Man, then might we assimilate the inspiration of a Newton to that of Moses, who described a series of worlds he had not seen or known, without any knowledge of even the first principles of that Science, by means of which the philosophers of the present day have been enabled to trace their natures, describe their contents, and arrange their order.

Again, Milton, after having prayed for inward light,

> "To see and tell
> Of things invisible to mortal sight,"

pourtrayed, in glowing detail, a history of the councils and wars of Satan and his rebel bands—events which he describes as having occurred before the existence of Man on the earth. When the scenes which have been thus depicted, are confirmed by evidence that cannot err, and when sense and experience shall prove his record true, we may then compare the inspiration of Milton with the inspiration that guided the pen with which the Mosaic narrative of

the order of the pre-Adamite creation was written. They were as different in their natures, and as incomparable with each other, as the wisdom which stretched forth the Heavens and laid the foundations of the Earth, and the wisdom which constructs a ship, or frames a complicated machine.

We thus advance another step in our establishment of the divine authority of the Bible. The facts developed by the Geologist not only confirm and substantiate the Scripture record, but they constitute the most conclusive and sensible evidence that exists of that direct communication between God and Man which is called divine inspiration. It is evidence that can, as it were, be seen and felt; and of such a nature, that it cannot be diluted by the plausible sophistries of the latitudinarian, so as to elude the believer's grasp. And thus Geology, the Sceptic's chosen weapon of offence, has not only failed him, but it has recoiled—he has leaned on it until it has pierced his hand; and the Bible has again triumphed in the struggle, to which it was committed by those who have always been labouring to turn its best allies, true science and pure philosophy, against it.

It cannot be doubted, therefore, but that this scene of the Creation depicted by Moses, emanated directly from the Almighty, and was communicated through him, for the instruction of the human

race; and strange to say, it has been preserved, when every other written record, sacred and profane, that existed contemporary with, or subsequent to it, for hundreds of years, have been blotted out and swept away by time's destroying hand. These facts alone would have been sufficient to entitle this ancient record to our peculiar consideration and respect; but when they are coupled with the still more important fact, that Geology has proved it to be TRUE as well as ancient, what can Man conclude, but that what the goodness of the Omniscient dictated, the power of the Omnipotent has preserved.

But further, it would be dishonouring to the Most High, to conceive it possible, that He who stooped to reveal the hidden things of the past to Man, and who has exerted his power to preserve the revelation through ages which have effaced every thing of a similar nature, should have permitted it to be tainted by association with any thing of authority inferior to itself. If He has protected it from destruction, we may rest assured that He has saved it from corruption; and thus the first page of the Scriptures sheds a lustre on every succeeding page, and is a pledge to Man that the divine author of the universe is the author of the Bible in its integrity, from Genesis to "the Revelation."

Thus Geology, so long the assumed vantage-ground of the Sceptic, and a stumbling-block to the inquiring believer, has proved the corner-stone and foundation of inspired revelation. It not only establishes the truth of the first page of the Bible, but it furnishes the most direct and sensible evidence of the fact of divine inspiration, and thereby authenticates the whole canon of Scripture. Its importance as an ally, in the contest between truth and falsehood, cannot be exaggerated. How often does the lamp of faith burn dimly to the wisest and best of Christians, and how frequently do they, at such times, require an anchor to stay the wavering mind from drifting into the shoals and quicksands of uncertainty and doubt—something to satisfy the sinking spirit that God has a special and protective regard for Man in his low estate; and where can the vacillating thoughts find surer rest, than in the knowledge that the very stones beneath our feet testify, not merely to the presence of the Most High in all his works from the beginning, but that, when their contents are collated with the Mosaic narrative, they furnish us with an assurance that He has stooped to communicate his counsels of old to one of ourselves for the instruction of his fellow-creatures? This gives a reality to revelation, and to us a pledge that the Almighty is with the children of men, not only as a creator and preserver,

but as an instructor, a guardian, and a guide. We no longer believe because we have heard with the hearing of our ears, but because we can exclaim with the Patriarch Job, after a survey of creative intelligence and power, "now mine eye seeth thee."

We have now journeyed with the geologist, as a friend and guide, down the stream of time, through the long ages which intervened between "the beginning" and the human era. As we advanced, new scenes and new orders or races of organic life have been presented to us at intervals, which though long, are distinctly defined; and from the Zoophyte to Adam, the ascent has been in regular order from the lower to the higher forms of animals. Slowly, but impressively, has Time, at the birth of each succeeding race, repeated the everlasting truth, that God, in the exercise of his creative powers, is essentially progressive. This is the law by which He moves, and by which his operations, in perfecting the work of his hands on our planet, have been regulated. It is the will of Him, with whom "there is no variableness or shadow of turning," declared by and through his works; and Man may calculate with confidence and assurance on its continuance. Time still flows on, and Man is still at the head of the Creation. But will it always be so? The steady progress of

the past demonstrates that a change must come, and that such change will not be retrograde, but in advance. It is written as with a pen of iron in the rocks for ever, that progressing time and progressing creation are inseparable, until perfection shall terminate progress, and the finite shall be merged in the infinite.

The creature which is to succeed imperfect Man, will therefore be of a higher order in the scale of created beings. But here philosophy fails us; and Revelation supplies the intelligence, that the coming creature will be the same, in what constitutes personal identity, with some of those of Adam's race which have existed and shall yet exist in this dispensation, but expanded into a being of an order transcendent to any thing merely human that has hitherto trod the earth. Here is true development and transmutation of species, but not by physical law—it is the operating and quickening power of the Holy Spirit. "It doth not yet appear what we shall be; but we know that, when He shall appear, we shall be like Him." The change will be from the likeness of the first Adam to that of the second Adam—from the natural body to a spiritual body —from the earthly to the heavenly, "when this corruptible shall have put on incorruption, and this mortal shall have put on immortality," through our Lord and Saviour Jesus Christ.

These are the teachings of Revelation—of things beyond the province of reason, and which could not be reached by sense and experience, the ordinary avenues of human knowledge. And yet it is of importance to know, that from the teachings of sense and experience it is, that we have derived the assurance of the communication having come from God. The most insignificant and unpretending fossil which we see and handle, when interpreted by the geologist, vouches, as we have seen, the divine authority of the writer of Genesis, and through it establishes the authenticity of the whole canon of Scripture; and when once we know that we are reading God's direct revelation to man, the information conveyed is as sure and conclusive to the mind as are the clearest sensible and scientific demonstrations. This we owe to the much slandered science of Geology, which, falling like a ray of light on the first page of the Bible, has disclosed it to be the first step in the ladder of knowledge, by which Man ascends from the dust and ashes of his low estate to the throne of the eternal and the infinite.

Of the physical relations between the Creator and the Created, there is more instruction to be gained from geological studies and research than from the whole of the transactions of the human

era. The natural history of the world associated with man affords but a narrow and limited view of the divine economy exercised in its construction, and yields us but scanty and imperfect information respecting the origin and order of the creation of the busy scenes of life with which we are surrounded. In the study of its phenomena, we see, as it were, but a small district of a strange country from an eminence, while all beyond, as regards its extent, its form, and its resources, are unknown. Whereas, in our perusals of the more extended history of the pre-Adamite world from the beginning, disclosed by the labours of the geologist, the entire system is spread before us—we are looking at the whole of the divine economy as on a map, and take in the minutest operations of the Omnipotent, from the formation of the first particle of solid matter upon our globe up to the creation of the creature made in his own image. We know, not merely that our world of light and life was in the counsels of the Great Architect before that the corner-stone thereof was laid; but we know what He, in his wisdom, designed should take place at the different stages of his vast work, and the processes by which He determined beforehand, that all the parts of the great whole should be fashioned and adjusted for its successive occupants.

Before Geology was known as a science, such knowledge did not exist. Apart from Revelation, all was clouds and darkness. Misty speculations of the eternity of matter, and an eternal succession of finite beings, were the creed of the Sceptic; and were not to be refuted by any argument of the Religionist founded on principles acknowledged by his antagonist. But with the aid of the geologist, bringing us back to a beginning of the matter, animate and inanimate, of our planet, the vanity of such infidel dogmas has been exposed; and we have been placed in a position to take, as it were, the framework of our globe to pieces, and to rebuild the mighty fabric from its very foundations. These are investigations worthy of the reason with which the Almighty has endowed and distinguished man from the other creatures which He had made, and which, when pursued with a teachable and submissive spirit, cannot fail to bring them nearer to Himself. Such has been the nature of the occupation in which we have been engaged in these pages; and in our ascent from stage to stage of the mundane structure, we have found the plan committed to Moses to correspond exactly with the divine workmanship. The word of God is thus authenticated by his works; and the great scheme of revelation, proclaimed to have come from a divine source, proclaims, in its turn, to fallen and

imperfect man, redemption and sanctification—a new heaven and a new earth—where

> "Those redeemed of Adam's race
> Shall dwell in righteousness and peace."

Who now can lay it to the charge of the Geologist that his investigations and discoveries have a tendency to shake the testimony of Holy Writ, and to unsettle the sure foundations of Bible inspiration? If our reasoning and conclusions have been correct, his facts teach nothing that is inconsistent with what Scripture has recorded; and the result of his labours (though it may not have been their direct aim) has been only to fill up, without erasure or correction, the outline of the Creation traced by the hand of Moses. Penetrating into the wide and wild ruins of the primeval worlds, his science has reduced their scattered and confused elements to system and order; and with their ancient stones an edifice has been raised, which, denounced by hasty zeal as a Babel of infidelity, has been proved by more patient research to be a pillar of truth, upholding those eternal verities, which are the pledge and assurance to man that he is a creature, not of time merely, but of eternity.

No other science has ever laid open for man's inspection, a vein of knowledge so rich and promising as this. Astronomy has always been con-

sidered, in the extent and sublimity of the objects of its inquiries, as the foremost in the rank of the physical sciences; but the contemplation of the vast and countless worlds which fill the realms of space, have taught us no truths, and supplied no instruction, of such transcendent value and importance to the human race, as that which has been collected by the Geologist from materials which are found within the precincts of our own planet. From the one science, we learn the doctrine of a general providence, and that the almighty author and sustainer of the universe is infinite in power and wisdom; and from the other, we know that He is a special providence, who is boundless in goodness and mercy to the creatures He hath made—for goodness and mercy, in their perfection and purity, must be the essential attributes of that Being who ordained and fitted the crust of our globe for the reception of vitality, and then, from time to time, poured out upon it those forms of organic life for which it gradually became suitable, until the platform of mundane existence had become adapted for man, and man came forth from his Creator's hand, surrounded with all that was necessary for the supply of his physical wants and enjoyments. Countless as earth's created beings are the evidences of the special presence of the Deity with the creature made

in his own image. Few there are, if any, of the items which compose the mineral, vegetable, or animal kingdoms, which are not found ministering to the well-being of the human race, when their structure and qualities, their origin and history, are developed by the natural philosopher. All of them may be shown, by the light of science, to have contributed, directly or indirectly, to the formation of our earthly abode, and the furnishing of it with the things necessary and convenient for us; and above all, we have been now listening to their voices going forth from the thresholds of their successive creations, proclaiming in unison the crowning evidence of their Creator's immediate presence with the children of men, in the fact established by geology, that He stooped to communicate his hidden counsels to one of human mould, for the information and instruction of his fellow-men. Therefore, as regards Man and his destinies, the study of the crust of his own planet, its past and present history, are fraught with instruction of more interest and value than could be supplied by the most extensive and accurate knowledge of the many and mighty worlds that fill the heaven's expanse.

Much indeed is due to the Geologist in every way. His researches have admittedly extended the boundaries of human knowledge, and contri-

bute largely to all that is valuable in many of the most important departments of civilized life. The Miner, the Engineer, the Architect, and the Agriculturist are indebted to this attractive science for a large proportion of the physical benefits and advantages with which they have supplied their fellow-creatures. From the same source the Natural Philosopher has learned how the foundations of the earth were laid; and how the vast fabric of Man's abode arose, adorned with life, and reflecting divine power and goodness from every stage of the mighty structure: and to these claims on our respect, may we not now add the more enduring blessing which extends beyond the precincts of human life into the realms of eternity, in that it has supplied us with a verification of the Record of Moses, thereby sealing with the seal of the Omniscient Man's charter to his everlasting inheritance? Let the votary of this science continue to prosecute his useful inquiries with that enthusiasm which has ever characterized the labourer in this fascinating field of philosophy. The mysterious interest hitherto experienced in the discovery and contemplation of its novel and sublime truths, will not be diminished by the consciousness that every established fact will supply another of the links which bind together the Record of Nature and the Record of the Bible;

and if there be truth in our identification of these two Records, the Religionist who ignored or misrepresented the facts of Geology, and the Geologist who scorned and disregarded the testimony of Moses, may henceforth meet among the graves of the extinct inhabitants of the pre-Adamite worlds, and each exclaim, in the language of the patriarch of old, "Surely the Lord is in this place; and I knew it not."

THE END.

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